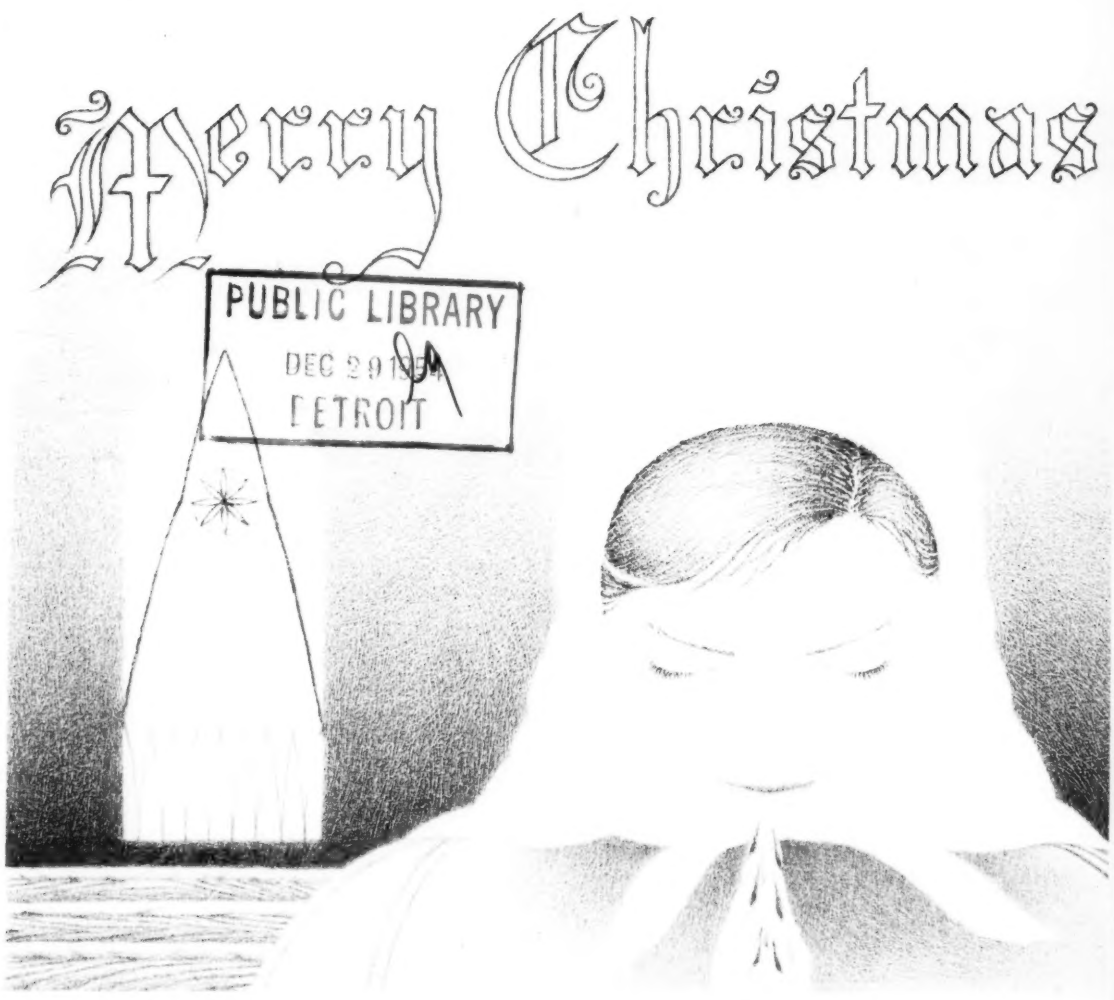
TECHNOLOGY DEPT.

Midwest Engineer

SERVING THE ENGINEERING PROFESSION



PUBLIC LIBRARY
DEC 29 1954
DETROIT

WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

INDUSTRIAL USES OF NUCLEAR ENERGY—PAGE THREE

WSE MEETINGS—PAGE TWO

Vol. 7 DECEMBER, 1954 No. 7

YOU DON'T HAVE to be a magician to obtain quality concrete on your jobs. You need only apply the simple, easily followed methods and procedures established through years of laboratory work and practical, on-the-job experience.

These methods and procedures for getting quality concrete are described in a free, non-technical booklet, *"Concrete Facts for Concrete Contractors,"* which answers such questions as:

How many gals. of water should go into a mix for a loading dock? (p. 9)

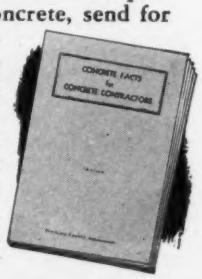
How should I place concrete to avoid segregation and honeycombing? (p. 18)

What method of mixing will assure uniformly colored concrete? (p. 27)

You must know the answers to these and many other questions covered in this booklet to get quality concrete. You know that delivering quality concrete is good business. Now, more than ever, a good job is your best advertising and selling force. Such good work creates satisfied customers who spread your reputation as a quality builder and so help sell more jobs for you.

How about your own concrete work? Does it measure up to quality standards? If not, then some one in your organization is not following good design and construction practice.

To help everyone in your organization become familiar with the easy-to-follow methods and procedures for obtaining quality concrete, send for the free, 48-page, illustrated booklet, *"Concrete Facts for Concrete Contractors,"* distributed only in the United States and Canada. This booklet is a helpful guide on the selection of materials, proportioning, mixing, placing, finishing, curing and many other subjects relating to quality concrete.



PORTLAND CEMENT ASSOCIATION

111 WEST WASHINGTON STREET, CHICAGO 2, ILL.

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

MIDWEST ENGINEER
Published Monthly
BY
THE WESTERN
SOCIETY OF ENGINEERS
AT
84 EAST RANDOLPH STREET
CHICAGO 1, ILLINOIS

John F. Sullivan, Jr.....*President*
Albert P. Boysen.....*1st Vice-President*
George L. Jackson.....*2nd Vice-President*
William R. Marston.....*Treasurer*
J. Earl Harrington.....*Executive Secretary*

Trustees:

John P. Gnaedinger — Joseph Kucho
Bruce A. Gordon — Charles L. Mee
Robert S. Hammond — Thomas M. Niles
F. A. Hess — J. T. Rettaliata
Hjalmar W. Johnson — O. G. Smith
Alf Kolflat — Dick Van Gorp

Ovid W. Eshbach.....*Past President*
Charles E. DeLeuw.....*Past President*
Leroy F. Bernhard.....*Chairman*
Publications Committee

J. EARL HARRINGTON
Editor and Business Manager

HAROLD K. EATON
Managing Editor

GENERAL AND EDITORIAL OFFICES
HEADQUARTERS OF
WESTERN SOCIETY OF ENGINEERS
84 E. RANDOLPH STREET
CHICAGO 1, ILLINOIS
TELEPHONE: RANDOLPH 6-1736

The Society does not assume responsibility for statements and opinions in articles, papers and discussions appearing herein. All material must be submitted on or before the 10th of the month prior to date of publication.

Copyright 1954 by the
WESTERN SOCIETY OF
ENGINEERS

Permission is given for the reproduction of any material herein, provided due credit is given.

Single Copy.....$ .50
Annual subscription.....4.00
Foreign subscription.....6.00

Entered as second-class matter at the post office at Chicago, Illinois under the Act of March 3, 1879.

Midwest Engineer

A Publication of the

WESTERN SOCIETY OF ENGINEERS

Serving the Engineering Profession

DECEMBER, 1954 — Vol. 7, No. 7

CONTENTS

Industrial Uses of Nuclear Energy..... 3
And Who Knows . . . ?..... 7
Letters from Leaders..... 9
Applications 11
Crerar Library News.....18
ESPS Listings 21
Professional Directory 22
Book Reviews 26
Personals 31
Obituaries 32
Advertisers' Index 32

COVER STORY

Far better than could any of our words, we feel sure, the cover picture expresses our good wishes to you at this holiday season. The picture bids you "Merry Christmas." We can only add, "and a Happy New Year."

—Picture by John Kenneth Baker

December 20—January 2

No regular meetings scheduled due to the holiday season.

Merry Christmas
Happy New Year

Greetings to all members of the Western Society of Engineers, to their families, and to their friends. And may they be blessed with the best of everything to make their lives in the coming year more full, prosperous, and the happiest ever.

January 5, Noon Luncheon Meeting

Speaker: Carlos Bell, assistant professor, Northwestern University.

Subject: "Nuclear Bombs and Water Supply." This interesting speaker will present a discussion of bomb explosions, the travel of atomic dust, depositation by rainfall, contamination of water supply systems, and measurement of radio activity.

Recently in the newspapers, on the radio, and on television, conflicting statements have been made on this subject. Why not come to this meeting and get an authoritative insight into this important question.

January 10, WSE General Program

Speaker: J. Peraino, chief engineer, Merritt-Chapman and Scott.

Subject: "Sub-structure Construction, Mackinac Bridge." If you were presented a check for $99,800,000 to build a bridge, what would your reaction be, and what kind of a bridge would you build? Well, the Michigan Mackinac Bridge Authority did receive such a check, and they are out to turn into reality the financially largest bridge project ever undertaken.

The huge bridge, ranking with the world's largest in weight and length, will link Michigan's two peninsulas which form the northern boundaries of Lake Michigan. The bridge is expected to be completed in late 1957.

When the above check was accepted by the Authority, its chairman announced the completion of a $26,000,000 contract to Merritt-Chapman and Scott Corp. for the sub-structure. That sub-structure is what you will hear about mainly at this meeting. The meeting is going to be an interesting one. Why not come to it and prove it to yourself?

January 12, Noon Luncheon Meeting

Speaker: Furnished by the Chicago Police Department.

Subject: "Drunkometer Demonstration." We know that none of our members will ever have anything but an intellectual interest in this subject. However, the drunkometer is making quite an impact on modern society, and the demonstration, using real live subjects, is bound to prove fascinating.

January 18, Transportation Section Meeting

Speaker: William Van Der Sluys, manager of engineering-design, Pullman-Standard Car Manufacturing Co.

Subject: "Light Weight Trains." Right around the holidays many of you are thinking about traveling and trains. You may have visited somewhere; someone may have visited you; there may be a new electric train in the house. It seems appropriate, then, that the light train, which is the modern train, be the subject of a meeting. Not just the members of the Transportation Section are invited—everyone is invited to the meeting. Won't we see you?

Industrial Uses of

Nuclear Energy

By Dr. Stuart McLain

The discovery of fission of uranium in the latter part of 1938, opened the road to the industrial utilization of the energy involved in the nucleous of the atom. The fact that the fission was brought about by interaction of U-235 atoms and neutrons, along with the fact that the fission process released additional neutrons, made possible the controlled nuclear reactor and the uncontrolled nuclear weapon. Prior to the discovery of uranium fissioning, the investigations in the nuclear field had been of purely academic interest and carried forward largely by university physics professors. While these men were interested primarily in expanding the known knowledge of the atom, most of them realized the potential importance of their work.

From 1938 on, it was simply a question of money, men, skillful research and development work to produce nuclear power. The accident of World War II resulted in the emphasis being placed on weapons.

The development of the nuclear weapons had important effects on the development of industrial or peacetime uses of nuclear energy. First, the development of power, *per se*, for civilian use was all but forgotten. Second, a tremendous amount of research and development was carried out as a part of the Manhattan District work. While this was directed at weapon development, many of the results were fundamental to the industrial use of nuclear energy. Third, several nuclear reactors were built as research and development tools, and these were available at the end of the war for research and peaceful applications. Fourth, a large number of men were trained in the field and very large laboratories were available. In fact, research and development were carried out on a scale uncommon in new developments. The only laboratories built on a similar scale are the NACA facilities and some establishments of the Department of Defense. Many of the top personnel left the nuclear field at the end of the War. Some, however, remained along with large numbers of young men and women. The laboratories have been largely rebuilt on a permanent basis.

A large fraction of the investment made by the United States in nuclear energy has been in the facilities for weapon production. Capital investments in nuclear energy plants are estimated as something over $5.7 billions. Of this, perhaps less than 10% has been spent on facilities for non-military applications of nuclear energy.

Present total employment including construction workers in all installations and capacities is about 135,000. It is expected that this will gradually decrease and level off in 1956 at about 90,000, since the major construction programs will have been completed.

Radioisotopes

A very large number of radioisotopes can be made in nuclear reactors. These are neutron rich and "decay" by emission of a beta particle or electron and gamma rays. Since very small amounts of radioisotopes were required for medical and other research work, they were supplied by the Oak Ridge reactor beginning soon after the end of the War. Production is still expanding. Nearly 50,000 individual shipments have been made to date.

The use of radioactive carbon or tagged atoms in the study of the life processes has been especially fruitful. An example of this type of research is the study of the factors which affect cell production and growth by use of tagged amino acids.

Radioisotopes have proven effective in the treatment of some diseases. For example, radiogold has been demonstrated as an effective palliative treatment of widespread cancer within the abdominal cavity. Iodine 131 is useful in treatment of hyperthyroidism. Phosphorus 32 has been found useful in the treatment of leukemia and polycythermia vera, a blood disease. Radiosodium is being studied as an aid in making skin grafts.

Boron 10 concentrates itself in brain tumors, and when irradiated with neutrons, produces alpha rays which produce localized intense radiation treatment of the tumor cells. While this treatment does not cure the patient, the average life is increased.

The use of radiocobalt to treat cancer is well known. The use of thulium 170 to take X-rays in the field was developed by Mr. Samuel Untermyer, formerly of Argonne.

In agriculture, radioisotopes have been used to develop a new rust-resistant oat and an improved peanut. Studies are under way to develop new strains in many grains, fruits, and vegetables by actual radiation-caused mutations. It is hoped that some of these will be useful.

The use of radioisotopes in industry is extremely varied and new uses are reported at frequent intervals. However, industrial applications have been much slower in development than in medicine and general research. Use for measurement of wear, thickness gages, oil movement, etc., are well known.

Stable Isotopes

While not as spectacular, the use of stable isotopes is steadily increasing. With stable isotopes it is necessary to run mass spectrographic analyses. Never-

Dr. McLain, program coordinator, Argonne National Laboratories, presented this talk before the Western Society of Engineers on Oct. 25, 1954.

theless, they have the advantages of ease of use, no change with time, and high concentrations can be used. For some purposes, they are more useful than the radioactive materials.

Gamma Irradiations

The radioactive isotopes are usually followed by counters which record each individual gamma or beta particle. For this reason, only minute amounts of materials are needed.

Large quantities may be used for certain purposes such as food preservation and chemical manufacture. In this work either irradiated fuel elements or the separated fission products may be used.

Irradiation of food with gamma rays destroys the bacteria and permits storage at room temperature. Canned foods may also be irradiated and the food sterilized without heating or cooking. Many problems are involved in this work. The amounts of irradiation must be determined for all types of foods. Then the effects, if any, on taste and vitamin content must be measured.

Work to date has demonstrated that meat can be kept for months if it is given pasteurization. Complete sterilization may not be required for meats which are sold in a few days after cutting.

The irradiation sources required for food sterilization are in the order of 1,000,000 r. Such sources require several feet of concrete or 15 feet or so of water for shielding. The installations will, therefore, be expensive to construct and the irradiated fuel assemblies or fission products will be expensive to ship any distance as a foot or more of lead shielding will be required. The irradiated fuel assemblies would require replacement about every six months. To sterilize a can of beans, for example, would require a two-hour irradiation at 1,000,000 r.

It is too early to predict whether or not there is any financial future in this work.

Power Reactors

It is in the field of power production that nuclear energy will play its most important financial role. The radioisotope as a research tool will contribute to the health and feeding of the world's people, but the nuclear reactor can produce the power to supply transportation and mechanical goods. Low cost power for irrigation pumps will make large areas of the world productive.

The nuclear reactor is a device for converting the potential energy of fissioning of uranium and plutonium into heat with or without the simultaneous production of new fissionable materials. Radioisotopes are considered to be by-products of the reactors since the amounts produced are almost insignificant on a weight basis.

There are a number of practical fission reactors.

Reactor Types

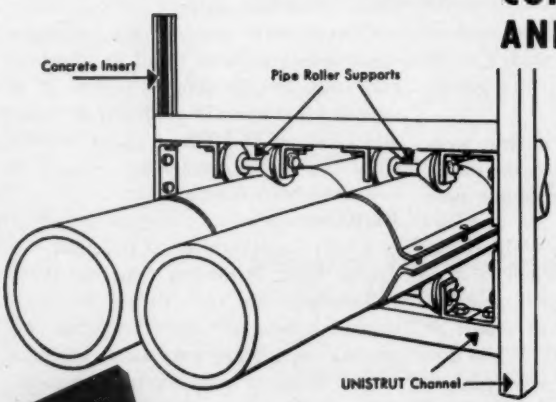
Pressurized Water, H_2O, D_2O
Boiling, H_2O, D_2O
Graphite, H_2O, or Na cooled
Fast
Homogeneous, $UO_2.SO_4$, Bi

The first reactor built was graphite moderated. It was located under the West Stands of the University of Chicago and began operation on December 2, 1942. This reactor was subsequently moved to the Palos Park site of Argonne National Laboratory where it was operated as a research tool until May of this year. This reactor was the forerunner of the Oak Ridge reactor and the Hanford production reactors. The second reactor was a heavy-water cooled and moderated reactor. This reactor was built at Palos Park. It began operation in May, 1944 and was discontinued just ten years later. This was the forerunner of the Canadian Chalk River reactor and the Savannah River production reactors.

All reactors consist of fuel in suitable form; fertile material to produce new fuel or radioisotopes; usually neutron moderating materials; coolants; fuel cladding and structural materials; shielding materials; means for loading and unloading; and the sensing parts of instruments for measuring the neutron flux, temperature, etc.

Beginning in 1948, a program of development of research and military reactors was started. These included the Materials Testing Reactor and the Experimental Homogeneous and Fast Breeder Reactors. These last two reactors have produced token amounts of electricity and the submarine prototype reactor has operated successfully.

SUPPORT MECHANICAL PIPING with UNISTRUT® METAL FRAMING, CONCRETE INSERTS AND PIPE ROLLERS



This completely adjustable metal framing system provides a new and more flexible type of mechanical support for every kind of piping. Assures exact slope or pitch. Permits adjustments, changes or additions to be made at any time. No drilling, no welding, no special tools or equipment. Saves time—cuts costs.

Write or Phone for **NEW FREE** *78 page Construction Catalog No. 700*

UNISTRUT PRODUCTS COMPANY
1013 W. WASHINGTON BLVD. • CHICAGO 7, ILLINOIS
PHONE: MOnroe 6-2665

UNISTRUT®
The World's Most Flexible All-Purpose Metal Framing

In 1951, four industrial study groups began a survey of the possible production of power and plutonium. Their reports were submitted in 1952. All the reports were favorable provided the price of plutonium was high enough. The Commission accepted the reports and decided to drop the dual-purpose phase and to place emphasis on the power production aspects of the program.

During 1952 and 1953, a program of development and construction of five power reactors was prepared and implemented by Congress with funds in 1954. This program, known as the Five Year Plan, calls for developing and constructing five different types of power reactors and some special fuel fabrication facilities.

Government Program

The first of the five authorized reactors is a full scale, not a pilot scale. Pressurized Water Reactor. In this reactor, light water at high pressure is pumped through the reactor and a heat exchanger or boiler to produce steam.

The development and design of this reactor has been assigned to the Westinghouse Electric Company as a logical extension of their work on pressurized water submarine reactors. Construction will be started next spring near Pittsburgh by the Duquesne Electric Company who will supply the turbine and generating facilities and operate the plant. The 600 psi saturated steam will produce at least 60,000 kw of electrical energy. The steam will be bled from the turbine for dewatering at low pressure and three feed water heaters will be used. The reactor will produce about 300,000 kw of heat.

Slightly enriched uranium will be used in the fuel plates. The direct cost of the plant can only be estimated as the budget costs include considerable development work. The pressurized water reactor is the only type that has been considered to require no pilot plant.

The General Electric Company has announced an interest in building a large scale pressurized water graphite moderated reactor. This is an extension of their work on operation of the Hanford production reactors.

The second reactor is a pilot sized boiling light water moderated and cooled reactor similar in basic design to the pressurized water reactor, except that the steam is produced in the reactor core by boiling. This reactor as developed by Argonne National Laboratory has a simplified flowsheet in that the intermediate heat exchanger and circulation pumps are eliminated.

The 600 psi steam will carry its radioactivity into the turbine. Therefore, the turbine and condenser must have no leaks. Corrosion products from the turbine and condenser may be carried back into the reactor. While these problems probably can be solved, the rate of heat production in the reactor may be lower than in the non-boiling type.

It is hoped that these questions can be answered by constructing a reactor at Argonne, about 25 miles southwest of here. The reactor is being developed and designed by Argonne. Sargent and Lundy have been chosen as the architect engineer. Allis Chalmers will supply the power producing equipment. The reactor will produce 20 MW of heat and 5000 kw of electrical energy. Construction is to be started in the spring of 1955. While this reactor is being built for use with light water, tests with heavy water may be run later.

The design of this boiling reactor is based on experiments carried out at Arco in 1953 and 1954. A small water cooled and moderated reactor was set up and conditions imposed that normally would be expected to cause an excessive power rise. It had previously been assumed that the core would melt and release the fission products under the conditions of the test. When excess reactivity was added very rapidly, rapid power excursions occurred, but the formation of steam in the core ejected the moderating water shutting off the nuclear reaction before dangerous temperatures occurred. Extrapolations of the test data indicate that instantaneous additions of excess reactivity up to 3.8% would be self limiting without serious damage when the reactor water is at the boiling point. With the water in the non-pressurized reactor at room temperature, instantaneous additions of excess reactivity up to 1.9% would produce similar effects. With 3.8% excess reactivity, the power level of a reactor of this type rises a factor of e (2.718) every 0.0024 seconds and with 1.9% excess reactivity, the power rises a factor of e every 0.0065 seconds. No regular operating reactor would ever be built so that more than perhaps 0.5% excess reactivity could be added in a short time. 0.5% is less reactivity than represented by the delayed neutrons. The experiments definitely demonstrated the inherent safety of pressurized water and of boiling water reactors, although the exact data hold only for the particular reactor under test.

The third reactor is a pilot scale sodium cooled graphite moderated reactor modeled in some respects after the Hanford production reactors. This reactor has been under development by North American Aviation. It will be designed by North American and built at their Santa Susanna Site some 25 miles north of Los Angeles, starting in the spring of 1955. The reactor will use slightly enriched fuel rods, stainless steel clad, and sodium cooling. Arrangements will be made so that the graphite moderator can be replaced. The sodium will leave the reactor at 875°F. The heat will be transferred to NaK. No power production facilities are planned, even though

(Continued on Page 13)

THE

ASBESTOS & MAGNESIA MATERIALS CO.

INSULATION

Approved Contractors and Distributors
for Johns-Manville

All types — Hot and Cold, Stack Linings and
Boiler Coverings, Refractories, Packings and
Insulating Brick

Diversey 8-4554 — 4562

2614 North Clybourn Ave. **Chicago 14**

Your Pet Project MAY BECOME A PRIZE PAPER

Jot down the ideas you've had for a long time . . .

Maybe they'll help you think of others . . . Maybe they'll win you one of the five, $100 prizes

Here are the rules:

Any member of the Society may compete regardless of grade of membership.

Papers shall not be highly technical in nature. A clear, concise and interesting coverage is desired rather than complex formulae or derivations. The subject discussed should be of general interest to engineers but should not be of a political or highly controversial nature.

All members of the Society who wish to submit papers in this contest should contact the Secretary as early as possible and not later than February 1, 1955, and request a copy of the rules governing the competition and an outline of the minimum requirements for acceptance of papers. These cover in detail the mechanical make-up which should be followed in preparing and submitting papers for the contest.

Papers must be submitted to the Secretary for acceptance by April 1, 1955. If the Secretary finds that they meet the minimum requirements of the contest, he will forward them to the Awards Committee for review. The papers will be identified by number only. The Secretary of the Society is the only person who will maintain the key to the authors.

If any paper does not comply with such minimum requirements, the Secretary will so advise the author and discuss with him the points which are below the minimum requirements. The papers which are accepted will be forwarded to the Awards Committee for judging not later than May 1, 1955. Papers which have not met the minimum requirements by that time cannot be considered for prizes.

Papers which are accepted will be judged on originality of presentation, editorial merit and value to the engineering profession.

The papers submitted must not have been previously published in substantially the same form. No copyrighted materials shall be used unless permission has been obtained and so indicated. All manuscripts, drawings, etc., are to become the property of the Society and cannot be published without the consent of the Society.

If the papers submitted are NOT of sufficient merit to warrant the award of any or all of the prizes, the Awards Committee reserves the right to award less than the five established prizes or to postpone the competition.

The winners will be announced and the prizes presented at the annual meeting of the Society in June, 1955.

WSE Executive Secretary will furnish you with a complete set of rules and minimum requirements on request.

"And Who Knows . . . ?"

By W. L. Everett, MWSE

This is the third time the Liberal Arts and Engineering Divisions have joined together at dinner at the time of the Land-Grant Association meeting. Last year my good friend Harlan Hatcher gave us a stimulating talk on "What An Engineer Ought To Know." He summed up his speech at the end by saying "an engineer ought to know just about everything." A logical subject for my talk tonight might well be "What the Humanist Ought To Know." Alternately, I might defend the engineer and explain why we are so human and at the same time so realistic that we doubt if we will ever attain his admirable goal.

One point on which engineers are willing to go all the way with our friends in Liberal Arts is the need for developing in our students an adequate facility in communication, both verbal and written, not only among ourselves but also with our fellowmen in all walks of life. There are many ways and purposes for which courses in writing might be developed. I understand that in a Washington institution they have instituted a course in ghost writing. The purpose of this course is to teach students to write in a manner which will assure that the speaker will understand what he is talking about.

While I have this captive audience, which includes representatives of the group upon whom we depend for the teaching of English to our students, I would like to enter a plea for a more human and less mechanistic approach to the teaching of verbal communication.

Two English teachers were in a train wreck; one who was dying said "Goodbye Charles, I am done for," to which the other replied "For heaven sakes Jim, don't say that. Don't end your last sentence with a preposition." Students, like other people, are apt to learn more from a model than from critics. I like the vivid and succinct language used by an English professor who rode a roller coaster for the first time. Asked by a friend to describe the experience, he said "You have just had time to recite the prologue to Chaucer's Canterbury Tales —when all - - - - breaks loose." Is it not true that the first requirement of effective communication, verbal or written, is to develop in the listener or reader an interest in what the communicator has to say or has written? Cannot more emphasis be given in our rhetoric courses to the importance of developing *interest?* If the student has stopped to think of what appeals to the listener, first and foremost, he will have an incentive to develop both better grammar and better unity and emphasis in his writing and in his speech. It can be made obvious to him that if he uses poor grammar he will not be able to interest educated men in his words. This approach should also enable us to develop in the freshman the need for other studies in the humanities and social sciences, because it should be easy to show him that in order to interest others he must understand the background and culture of his listeners, and this requires continued education in many fields. Too often our students are frightened away from the social and humanistic areas by their teachers of rhetoric. These men and women have one of the greatest opportunities of all to initiate an interest in a broad intellectual outlook. This would also lead to the recognition of the importance of empathy, an appreciation for the viewpoint of others—something all men need today, and a word which is heard all too seldom.

If, on the other hand, we must stimulate the student by appealing to his selfishness, he can also be made to realize that his own progress will be determined largely by how he interests others in his ideas, and the most important of these "others" are apt to be men of culture, who will judge him by the form as well as the content of what he has to say.

If it is true that communication requires the development of interest on the part of the listener, is it not a paradox that our courses in the art of communication are quite generally considered by students (and not merely by engineering students) to be uninteresting?

But I did not come here tonight to criticize, rather I am here to explore how we may work together. This means that we should be friends. It also means that we must be perfectly frank with each other if we are to achieve real cooperation. I heard of a man who said to his wife on his 25th wedding anniversary, "Well, darling, I haven't deceived you yet." To which she replied, "No John, but it's not from lack of trying."

Our need for cooperation is emphasized by our present peril. Peril is not new to the human race. Someone has said that the trouble with each generation is that it hasn't read the minutes of the previous meeting. In history we have many examples of perilous times. Sometimes the intellectual climate has produced statesmen who have led the people out of their troubles to greatness, and at other times such statesmen have been lacking. As an example in our own American history, consider the period of the late Eighteenth Century when our nation was founded. Our constitution was written and adopted and thirteen antagonistic colonies were welded into a nation. Contrast this period of the late Eighteenth Century with the 1850s, when there was a widening chasm between proslavery and antislavery publicists and literary men, when fanaticism on both sides replaced reason, and the terrible war which resulted was followed by a reconstruction period in which statesmen and men of good will were notably lacking or ineffectual. Similar examples may be drawn from the history of France or England, of Rome or Greece.

W. L. Everitt, dean of engineering, University of Illinois, presented this talk under the title "And Who Knows Whether You Have Not Come to the Kingdom for Such a Time as This?" on Nov. 16, 1954. He gave it before the Joint Dinner of Liberal Arts and Engineering Divisions Association of Land-Grant Colleges and Universities.

In spite of criticism and anti-intellectualism, there has probably been no previous era in which so much faith has been placed by the people in education and in educators. Furthermore, while in previous centuries, scientists and engineers generally did not make, and were not expected to make, contributions to the solution of political problems, it is doubtful if people today would accept conclusions unless they were based upon a proper understanding of medern technology. This places a great responsibility upon all of us. I am sure you are all familiar with the story in the Book of Esther. At that time a whole people were threatened with total destruction, for King Ahasuerus had been persuaded by his Prime Minister Haman to issue an edict, and I quote from the words of the third chapter: "to destroy, to slay and to annihilate all Jews, young and old, women and children in one day, and to plunder their goods." To that people the threat was just as real, just as terrible probably even more real and terrible than any thermonucleonic bomb is to us. In this emergency, Mordecai persuaded his niece Esther, at peril of her life, to intercede with the king, saying in Esther 4:14, "And who knows whether you have not come to the kingdom for such a time as this?" In times like this I ask the same question of our intellectual leaders—humanists, engineers, scientists, lawyers, political scientists, political practitioners—and most especially of such leaders who are functioning in our educational institutions.

I wish that I could come before you tonight with a well-worked-out and integrated plan which I could believe would solve our problem. Even more, I wish that I could have faith that a committee or a conference participated in by all our disciplines could produces such a plan. But I have no such hope that we can work out *farseeing plans* to which events will conform. With both the physical and the political world moving as rapidly as they do today, we must work for intellectual flexibility coupled with wisdom rather than with the long-range foresight of the soothsayer. But it will not be sufficient for our democracy to have intellectual flexibility among a few leaders only, even though we might hope they had the necessary wisdom. Having just passed through an election we know that flexibility does exist in our body politic, but after reading campaign speeches, one wonders whether it is coupled with wisdom—else why do our candidates of both parties appeal not to our reason but to our emotions and prejudices? The answer to this question is clear—it is because, from their experience, politicians believe these tactics will get them elected. If they are right in their belief, and I am afraid they are, this points up a task for us. The need for intellectual flexibility combined with wisdom places a responsibility on educators as never before.

It has been said that in recent years we do not have a signing off of wars, but only short pauses for enemy identification. Some think this enemy identification is simple, as in each period of history men have thought it simple because they could point to external tribes or nations planning or waging war against them. But can we assume that our enemies are only specific foreign nations or domestic subversive groups? The most dangerous enemies are those who are not recognized, particularly if they are among ourselves. They may include, to list just a few—ignorance, rigidity of thinking, intellectual snobbishness, personal indulgence posing as scholarship, lack of understanding, yes, lack of empathy. Even in a world of uncertainty we can attack these enemies now; we do not have to wait for them to declare war on us. Are we as a group going to be part of the problem, or part of the answer? We cannot be part of the answer if we are indifferent, lazy, or mere hand wringers. We must take a positive approach.

First of all, the working together of all men of good will is now essential. There is no time left for controversies among disciplines or professions. There is no time left for mere crying over our own or others past mistakes.

This working together must be sincere rather than superficial. The integrity of each discipline and vocation must be preserved, while at the same time each must search its soul. In engineering education we are doing this assiduously, as I am sure you in the Liberal Arts are, too. One example of the self-analysis of engineering education is the current study of Evaluation of Engineering Education by a committee of the American Society for Engineering Education under the leadership of Dean Grinter (MWSE). I hope some of our Liberal Arts friends will take time to read the report and, if they care to, give us criticisms of it.

We must realize that the world can only move forward, so there is no use in wishing that nuclear energy had never been discovered, or the airplane invented. A hiker in the woods who was lost said, "I wish Emily Post were with me, I must have taken the wrong fork."

(Continued on Page 19)

DURAPOLE
ESTABLISHED 1892
The Original
• NON PRESSURE FULL LENGTH TREATED POLE •
VALENTINE CLARK CORPORATION
ST. PAUL 8, MINN.

On Training —
Letters from Leaders

In the last issue of Midwest Engineer we published another of about thirty letters received from leaders of Chicago-area firms concerning shortcomings noted in the engineers in their employ. Many of the letters also suggested what the engineers should do to correct their deficiencies.

Significantly, the engineer's technical training is generally considered adequate. In the broad area of Human Relations, however, engineers seem often to be "under achievers," according to the viewpoint of the industrial leaders as reflected in their letters.

We are printing another of these letters in this issue, as we shall do in future issues. Although the letters may be of greatest value to the younger engineers, we hope that all of the engineers who read them will benefit.

Here, then, is the next letter:

Dear Mr. Becker:

Your letter of August 31, 1951, addressed to Mr.....was referred to the writer for reply. The results of a survey of the opinions of our Engineering personnel are as follows:

"Fifteen years ago, the formal mathematical training for an Engineer usually ended with the standard college courses in analytical geometry and elementary (differential and integral) calculus. This was permissible because practically all Engineering could be done with the formulae and practical methods easily derivable from elementary calculus. The last decade, however, has seen a definite change. Today, the theorems and principles of advanced calculus and partial differential equations are in everyday use to an extent far beyond that which elementary calculus was used prior to 1940. Beyond all doubt, a good advanced calculus course is now a mandatory subject for every Engineer. Moreover, the last five years has witnessed an additional development, namely the growth and importance of numerical methods for attacking complicated algebraic and differential equations unsolvable by exact methods. This makes a sound grounding in numerical methods, also, a necessary element in the Engineer's training.

"The mathematical method of solution of Engineering problems is an extremely important one and should be developed in the universities as fully as possible. Mathematics is useful to industry only if it can provide reliable answers to problems more quickly and with a lower cost than the experimental method. This being the case, the people who are to work in industry should be educated more thoroughly in the applications of mathematics and also in the use of various mechanical aids to computation such as desk calculators, and in the near future, office-sized differential analyzers, IBM equipment, etc.

"It is our opinion that mathematics is an important tool, but, most technical graduates have not been sufficiently well-schooled in its application and usage.

"From the standpoint of advancement to Supervisory and Executive positions, we have found that many of our young Engineers could use additional training in effective speech, composition, report writing and those subjects which will improve his personality and his ability to get along with people. A good Supervisor should know not only the technical aspects of his position, but also how to get others to work with him. Many of our Engineering Supervisors have expressed the opinion that they would be more effective Supervisors today if they had additional training in the liberal arts. One Supervisor went so far as to say that, before taking up the study of the technical aspect of Engineering, a man should have two years of strictly liberal arts training."

I sincerely hope that the above information will be of assistance to you in focusing the attention of your Engineering group in their endeavor to improve themselves in the Engineering profession.

Very truly yours,
(Signature)

Promotion of the Heat Pump Asked

The electric utility industry was asked to energetically promote the heat pump as a means of stimulating public acceptance of the unit in a speech made before the Southeast Electrical Exchange in New Orleans on Oct. 28.

The heat pump is the completely self-contained system that — without water or flame — provides warm filtered air in the winter and cool, dehumidified air in the summer.

"Those utilities which are most aggressively promoting the heat pump have realized that while the specific parts of the heat pump are not new, the operating characteristics and application requirements for the unit are new," M. S. Angier, heat pump product manager of the Westinghouse Electric Corporation told the utility men.

"Public acceptance," Angier said, "would be even more enhanced and the market would more rapidly increase if all utilities would provide prospective customers with engineering service as to the proper size of heat pump and the minimum specifications for wiring and duct and house insulation."

On Rumor

Rumour is a pipe
Blown by surmises, jealousies,
conjectures.

—Shakespeare

— CUSTOM BUILT —

To Your Specifications

Switchboards, Benchboards, Panelboards, Steel Cabinets, Distribution Panels, Motor Control Centers, Junction Boxes, Raceways, Sheet Metal and Light Structural Fabrication, Busducts.

GUS BERTHOLD ELECTRIC CO.

1716 W. HUBBARD ST. CHICAGO 22, ILL.

CHesapeake 3-5767

Aluminum Spans Used for Bridges

The use of aluminum erection spans, an innovation in bridge building practice, promises greater safety in deep-water operations, plus speed at least equal to conventional methods, Engineering News-Record, McGraw-Hill publication, reports. In addition to the hoisting and moving advantages gained by aluminum's light weight, the procedure eliminates the use of falsework of permanent steel intended for use elsewhere on the job.

Two 280-ft. long aluminum truss spans are being used as work platforms to erect 289-ft. long steel truss spans on the superstructure of the Richmond-San Rafael Bridge across the north arm of San Francisco Bay. Constructed at a cost of $150,000 each, the aluminum erection spans provide a solid working surface and can be hoisted into position with equipment required for other phases of the erection work. The spans rest on brackets attached to the bridge's permanent piers.

Traditionally, the magazine points out, two methods of truss span erection have been followed: assembly in place on some sort of temporary platform or falsework; or pre-assembly and floating into position. The platforms are supported by temporary piles where the bottom is not rocky; however, the Richmond-San Rafael project would have required pile lengths too great to be economical. Steel trusses, occasionally used temporarily as erection spans and then used elsewhere on the same project as permanent fixtures, would have been impractical on this job due to their weight—in excess of 400 tons apiece. (The aluminum spans weigh 177 tons.)

Floating the spans into place also was ruled out, since the steel truss assemblies are too heavy for economical hoisting operations. Moreover, floating in at a high level involved a risk of tipping, since some spans are as much as 170 feet above mean sea level, and the site is subject to treacherous tidal currents and high winds, according to the magazine.

Only 13 Per Cent of Engineers Own Stock

America's professional engineers are directly involved in creating the Nation's wealth but only 13 per cent of them are owners of corporation stock, the president of the New York Stock Exchange has declared.

Writing in the November issue of the AMERICAN ENGINEER, official publication of the National Society of Professional Engineers, G. Keith Funston cites a Brookings Institution study which showed approximately 80,000 engineers as owning stock in publicly-owned corporations.

Funston calls this a surprisingly small total compared with the some 633,000 engineers in this country employed at the professional level.

The Brookings study indicated that 30 per cent of the country's engineers receive an annual salary income of $7,500 and above, while 44 per cent earn between $5,000 and $7,400, Funston stated.

Occupying a "key position in our economy, engineers know . . . they are building for today and for the future."

Kick-Off Party Was Great Success

The WSE Kick-Off Party held on Nov. 5th was a big success. Also, it carried on the tradition of opening the social season with an outstanding dinner dance for engineers and their wives. The social hour proved to be an adventure in good fellowship. It provided an excellent opportunity for the many officers and committee chairmen to expand their circle of friends within the Society.

After the deluxe dinner and the big send-off by Jack Sullivan and Charlie Rummel, Paul Meeker and his Drake Hotel Orchestra provided the entertainment and dancing for which they are famous.

The Kick-Off party was the first of four parties planned for the season by Dick Smith and his Special Events Committee. The other dates are:

January 14, 1955
March 4, 1955 and
April 29, 1955

Be sure to mark these dates on your calendar, now. Also, plan now to attend the party on Jan. 14. You will see Robert Bacon's "Motoring through Mexico," which none of you want to miss. Mr. Bacon had done a terrific job of putting together a program to give you the feeling of a Mexican vacation. His "vacation" will include many special and unusual features. Whether or not you plan a real vacation in Mexico you will find a lot of interest and entertainment in "Motoring through Mexico." As an added attraction, the Strollers will provide music for your dancing in the dining room. Don't miss Jan. 14, and don't miss the other events planned for you.

$1,000 Scholarship Is Established at IIT

A $1,000 annual scholarship has been established at Illinois Institute of Technology, Chicago, to further the education of an engineering student enrolled at the school.

The grant was established by the Morris Seren Foundation of the Seren Tool and Manufacturing company, 1800 Fulton street, Chicago.

Scholarship winners will be selected by the Illinois Tech scholarship committee and approved by the Seren Foundation.

MUNCIE CONSTRUCTION CORP.

Contractors
for
Utility Maintenance
and
Construction
Transmission Lines
Substation
Distribution Systems
Plant Electrical

201½ East Adams Street, Muncie, Indiana

WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

89-54 Richard D. Borgstadt, Engineering Manager, Westinghouse-Chicago, Merchandise Mart Plaza.

90-54 Arnold M. Lund, Architectural Designer, Kraft Foods Co., 500 N. Peshtigo Ct.

91-54 William T. O'Donohue, Field Service Engr., A. M. Byers Co., 135 S. LaSalle St.

92-54 Dewey W. Johnson, Research Engineer, Cast Iron Pipe Association, 122 S. Michigan Av.

93-54 Wallace T. Miller, Research Engineer, Cast Iron Pipe Association, 122 S. Michigan Av.

94-54 Herbert L. Slack; Chief, Struct'l. Engrg. Sect., General Services Administration, Public Buildings Service, 219 S. Clark St. (Rein.)

95-54 John E. Blair, Instructor — M. E. Dept., Illinois Institute of Technology, 3300 Federal St.

96-54 Frank M. Fisher, Turn Foreman Blowing, Blast Furnace Dept., United States Steel Corp., 3426 E. 89th St.

97-54 Bernard J. Connelly, Vice President-General Mgr., Minerallac Electric Co., 25 N. Peoria St.

98-54 Robert D. Golly, District Sales Engineer, Rome Cable Corp., 4505 W. Grand Av.

99-54 W. H. McFarland, Metallurgical Investigator, United States Steel Corp., Gary Steel Works, Gary, Ind.

100-54 Edwin Vennard, President, Middle West Service Company, 20 N. Wacker Dr.

101-54 Fred B. Friestedt, Project Director, Sumner Sollitt Co., 307 N. Michigan Av.

102-54 Merton D. Conolly, Engineer I, Commonwealth Edison Co., 72 W. Adams St.

103-54 Don B. Gallay, Project Engineer, Corps of Engineers, U. S. Army, 475 Merchandise Mart.

104-54 Cecil Moyser, General Supt., Herlihy Mid-Continent Co., Box A, Comstock, Mich.

105-54 Howard J, Cuny (Rein.), Supt. Shops & Tool Service, Commonwealth Edison Co., 72 W. Adams St.

106-54 Elmer W. Passow, Plant Engineer Jr., Argonne National Laboratory, PO Box 299, Lemont, Ill.

107-54 J. B. Kolko, President & Owner, Speedway Wrecking Company, 58 East 29th St.

N.U. Technological Institute Creates Gas Dynamics Lab

The Department of Mechanical Engineering in the Technological Institute of Northwestern University has expanded its facilities through the creation of a Gas Dynamics Laboratory. Now almost one year old, the laboratory has been working on fundamental problems underlying the operation of gas turbines, jet propulsion and rockets.

Financed by the University, the laboratory serves three main functions in providing: 1. research work for graduate students studying towards Master of Science and Doctor of Philosophy degrees; 2. instruction in the fields of compressible fluid flow and high velocity combustion processes; 3. unclassified research under contract from private industry andor governmental groups; 4. the organization of post graduate symposia and conferences for scientists and engineers interested in phenomena dealing with high velocity flow processes.

So far the emphasis in research has been in the field of turbulent combustion such as that encountered in jet engines. However, preparations are under way to study the combustion instability problems encountered in rocket motors. In the field of instruction four courses for day and three for night offering have been set up and are being taught by the department. A symposium to discuss aerothermochemistry has been announced and is scheduled for August 22, 23, 24, 1955.

The Haines Company

Ventilation & Air Conditioning Contractors

Sheet Metal Fabricators

— Welding —

1931 WEST LAKE STREET

CHICAGO 12, ILLINOIS

SE eley 3-2765

Join Your Friends and business associates.

- *Dine with the family*
- *Lunch leisurely*
- *Relax in the lounge*
- *Luncheon- 11:30 a.m.-2 p.m.*
- *Dinner- 5:30 p.m.-8 p.m.*
- *Use the lounge and dining room for your parties*

For reservations, call RAndolph 6-1736.

Western Society of Engineers

84 East Randolph Street

Nuclear Energy

(Continued from Page 5)

some 7,500 kw of electricity could be produced from the 20 MW of heat.

Construction of the pilot sodium graphite reactor should start in the spring of 1955 at Oak Ridge National Laboratory.

The advantages of the sodium cooled reactor over water cooled reactors are the higher surface temperatures of the fuel elements permitted due to lower corrosion rates with subsequent high thermal efficiencies, low pressure operation of the reactor, and high heat transfer rates. Disadvantages are the additional heat transfer and pump equipment that must be added, the difficulties in loading and unloading, the induced radioactivity of the sodium, and the non-compatability of sodium or NaK with water and air. Even though two heat exchangers must be used in parallel to prevent the radioactive sodium and boiling water to come into contact with one another in case of a tube break, the costs may not be excessive since the heat transfer film coefficients are high—of the order of 20,000 to 30,000 BTU/ft² hr °F. This compares with 7,000 to 10,000 BTU/ft² hr °F for water.

The fourth reactor is a larger or intermediate sized version of the homogeneous reactor under development at Oak Ridge National Laboratory. This pilot reactor is definitely longer range than the three mentioned previously; in fact, a second experimental unit is now being built to obtain design data for the pilot reactor. The pilot reactor will operate at 65 MW of heat and produce 16,000 kw of electrical energy. The present concept makes use of UO_2SO_4 dissolved in heavy water.

There are a number of advantages claimed for homogeneous reactors as compared with heterogeneous reactors, these are:

a. Simplified fuel preparation.
b. Simplified chemical recovery costs.
c. Removal of gaseous fission products.
d. Simplified reactor construction.
e. Stable operation due to large negative temperature coefficients.
f. High power densities.

In addition to the advantages, there are several disadvantages:

a. A large part of the fuel is outside of the reactor, in the heat exchanger, pipes and pumps.
b. Delayed neutrons cause radioactivity in external systems.
c. Corrosion may be higher.
d. Leaks are serious, since fission products and fissionable materials escape.
e. Slightly higher enrichment is required due to increased resonance absorption.
f. There is no fast fission effect.

The fifth reactor project is an intermediate sized fast breeder under development at Argonne National Laboratory. The experimental breeder reactor, EBR-I, at Arco, has already demonstrated breeding at a 1400 kw of heat power level. Fully enriched U-235 was used in EBR-I in a reactor core about the size of a football. The reactor was cooled with NaK and was the first reactor to produce electric power.

The intermediate scale reactor is designed as the next step in the development of the full scale power breeder. The fuel will be diluted with depleted uranium to form a larger core and permit higher power production. The heat production will be 62.5 MK with a net electrical power output of 15,000 kw. A depleted uranium blanket will surround the core for production of plutonium or breeding. The reactor will be cooled with sodium which will leave the reactor at 1000°F to produce, through a NaK heat interchange, steam at 1800 psig. The sodium will be circulated by an electromagnetic pump driven in turn by a homopolar generator. The homopolar generator will produce 200,000 amperes up to 3 volts. NaK will be used as liquid brushes and also to cool the generator. The NaK will leave the generator at about 250°F and will be externally cooled.

The electromagnetic pump will handle 10,000 gpm at 60 psi head. The cross section of the pump throat will be 6 inches in the direction of the magnetic field of 6000 Gauss and 18 inches in the direction of the current. The throat will be made of nichrome with a sodium velocity of 30 feet per second.

The Intermediate Breeder or EBR-II is definitely a longer range project than the first three projects. It is planned to build the reactor at Arco. Exponential experiments are being run and a zero power reactor or critical assembly is under construction at Arco.

The full scale breeder might be quite similar to EBR-II. The core would be larger and more heat would be produced. To circulate the additional sodium, we would add more pumps and heat exchangers rather than increase the size. For this reason, the EBR-II is a real pilot plant.

Advantages of fast reactors are:

a. The conversion ratio is much higher than for thermal reactors, being of the order of 1.5 for fast and 0.7 to 1.0 for thermal reactors. The high conversion ratio means that all the world's uranium and thorium can be converted into fissionable fuel.

b. Neutron cross sections are lower. This is an advantage in that stainless steel may be used as the cladding and structural material along with sodium coolant. This results in a high thermal efficiency. Xenon and other poisons in thermal reactors are not serious in fast reactors.

c. The amount of control required is less

Producers and Shippers
of
Transmission & Distribution Line Poles

Western Red Cedar — Douglas Fir — Western Larch
Wood Pole Preservation — Non-Pressure
Full Length Treating with Penta or Creosote
Machine Shaving — Machine Incising
Roofing — Gaining — Drilling

BELL 1954 LBR & POLE CO.

BELL LUMBER & POLE CO.
Minneapolis 1, Minn.

than in thermal reactors since the poisons from the fission products are low.

The disadvantages of fast reactors are:

a. The minimum amount of fissionable material is 10 to 100 times that required for a thermal reactor. However for large power levels, the amount of fissionable material in a thermal reactor may be several times the minimum in order to have adequate heat transfer surface.

b. Control of a fast reactor must be carried out by movement of the uranium core or blanket rather than by addition of a poison, since all materials have low cross sections. Due to the very short neutron life in fast reactors, control must be rapid, but, as noted above, the amount of excess reactivity needed is low.

The five reactors mentioned above and the plutonium fuel element facility make up the construction authorized by the Government's Five Year Program. In addition to these six projects, there are the Naval, Air Force, and Army programs. While these defense programs are not directed at the production of civilian power, they have contributed and will continue to contribute technical know-how and ideas. As noted, the Shippingport Reactor is a follow up of the work on the Submarine Thermal Reactor at Argonne and Westinghouse. Likewise, important work on liquid metals and components has been done at Knolls Atomic Power Laboratory by the General Electric Company as a part of their work on the Submarine Intermediate Reactor. The work on the so-called "Packaged Power Plant" for the Army will be directly applicable to small civilian power plants—in fact, many features of such plants might be identical.

While not included in the Five Year Construction Program, there is a large Government program of reactor development in general and on specific reactors in some cases. Brookhaven National Laboratory is developing the liquid metals fueled reactor in which a solution of uranium in bismuth is pumped through the reactor. This reactor also has promise of producing economic power, but at the time a choice of a limited number of reactors was made for immediate construction, this reactor appeared to be a longer range project.

The Fluor Corporation has been designing a pressurized light water reactor in cooperation with North American Aviation Company. The installation cost is $174 per kilowatt. Designs have been made of different plants to produce 60,000 up to 300,000 kilowatts. The reactor could be of the dual-purpose type and produce plutonium as well as power. The plutonium could be sold to the Government for weapon use or recirculated to the reactor.

The estimate of power cost as made by Fluor varies from 5.5 to 7.75 mills per kw hr. The lower value of 5.5 mills was based on U-235 costs of $20 per gram and the higher value on $50 per gram U-235.

The Atomic Energy Commission spends about $125,000,000 per year on development, construction, and operation of experimental reactors for all purposes including defense. This figure includes the cost of the auxiliary fuel fabrication and chemical processing plants. The total cost of construction of the five reactors discussed above, along with the necessary fuel and chemical plants, will be in the neighborhood of $100,000,000 with perhaps another $100,000,000 total from the yearly budgets used for direct development work and operation costs. The Shippingport Reactor will produce significant amounts of power and a portion of its costs will be recovered. The Duquesne Electric Company contributed $5,000,000 towards its construction. The three short range projects, i.e., the Pressurized Water, the Boiling, and the Sodium Cooled Graphite Moderated Reactors, will be completed in 1956 or 1957. The two longer range projects of the Intermediate Homogeneous and Fast Breeder Reactors will be completed in 1958 and 1959.

Industrial Program

In addition to the Government's program outlined briefly above, several government agencies or organizations and sixteen private industrial groups are studying the possibilities of building economical power reactors. Other groups are being organized. The Detroit Edison and associated companies have a sizable design and development program. The Power Study Group, the Monsanto Chemical Company, and the General Electric Company have sizable design and study groups. The General Electric Company has recently announced interest in the boiling reactor and the high pressure water cooled graphite moderated reactor. Westinghouse Electric Company is directly involved in the Shippingport Reactor as is the Duquesne Electric Company. Except for the Shippingport Reactor, none of these groups have made any announcement concerning specific plans to build reactors.

The Commission has announced recently that it will consider the best design each year for partial Government support on the basis of plutonium purchase. This is a return to the dual-purpose concept.

In addition to private groups, TVA and other Government agencies are watching nuclear reactor developments to see if they should build nuclear energy plants.

Discussion

The objective of the Government's program is to provide the technical information necessary for design of full scale power reactors. The medium sized plants appear to be large enough that most technical problems will be met

THE MONADNOCK
53 West Jackson Blvd.
Chicago 4

LONG RECOGNIZED AS
Headquarters for Office Space
FOR
Engineers
Architects
Patent Attorneys
Manufacturers'
Representatives

ALDIS & COMPANY Management

A nationally-known business address

and extrapolation to full scale plants can be made. Actually, these pilot or intermediate sized plants will use many items of equipment such as fuel elements, pumps, and heat exchangers which will be, or at least will approach, full scale. In the full scale plants several pump and heat exchanger loops will be used in parallel.

After the pilot plants are placed in operation, they will be used for experiments designed to improve the operation or to increase the power levels and to reduce the costs of reactors.

The main technical problems that must be solved are primarily those involved with heat removal and safety. Heat removal in heterogeneous reactors is dependent on the development of satisfactory fuel elements and the utilization of these fuel elements at high heat transfer rates as indicated earlier. Progress has been made on the fuel element problem and reasonably satisfactory fuel elements have been produced. The costs have been high and a very great amount of development work remains to be done.

Most of the fuel element development has been directed at complicated designs. Simpler, more readily manufactured fuel elements must be developed. To be economic for power production only, a burnout of at least one and preferably two atoms per hundred is required. This results in the addition of one or two atoms per hundred and the displacement of literally all the atoms present in the fuel element many times during its life. Not only must the fuel withstand these stresses and strains, but the heat transfer rate through the metal must remain high. Luckily, the damage to the fuel element cladding is only that caused by the neutrons and gamma rays.

The second problem is that of heat transfer rates. It is desirable that rates of 1,000,000 to 2,000,000 BTU/ft^2 hr be obtained and we would like to consider higher rates. To get such rates requires high film temperature drops coupled with high liquid flow rates with danger of erosion-corrosion. Rates approaching 1,000,000 with pressurized water may require film boiling. With liquid metals, heat transfer rates of 2,000,000 BTU/ft^2 hr may prove feasible. Flow rates of 35 to 40 ft/sec appear as high as practical.

The third problem is that of safety. If we assume that several per cent, say two per cent, of excess reactivity can be added instantaneously to an operating reactor, the power will rise exponentially at a very rapid rate. Melting or gasification of the fuel elements in the reactor might occur with release of the gaseous or all the fission products. To make certain that a series of errors cannot result in such an addition of excess reactivity, the reactor control systems are designed to permit only small rapid changes in reactivity with the large changes being made slowly. Nevertheless, it is desirable that each reactor have some natural characteristic built into it that will shut the reactor down without danger of release of the fission products when an excessive amount of reactivity is present. If an inherent safety mechanism is built into the reactor, no serious harm can occur if the operator makes an error.

The control instrumentation systems are designed to override and reverse operator errors. For example, in the Materials Testing Reactor, the instruments will reverse the direction of the control rods and shut down the reactor if the operator attempts to add reactivity at too rapid a rate during startup.

As noted previously, boiling in pressurized water and boiling reactors is an inherent safety mechanism since the boiling ejects the moderator. The sodium cooled graphite moderated reactor is potentially very safe due to expansion with temperature rises. The Homogeneous Reactor ejects some of the fuel from the core due to expansion of the liquid fuel solution. The Fast Reactor must be studied further, although the small Experimental Breeder has proven to be very safe. As an added final precaution, sealed buildings have been designed to prohibit the spread of fission products or plutonium in case of a catastrophe. Examples are the Research Reactor Building at Argonne and the steel sphere at West Milton, New York, built to house the Submarine Intermediate Reactor.

In respect to economics, the Government's program of five reactors will indicate trends, but realistic costs will not be obtained, even on the Shippingport Reactor. In the first place, this reactor is too small to be really economically competitive with larger fossil fuel fired plants. In the second place, the reactor is necessarily being designed on a very conservative basis. The primary requirement is that it operate successfully. Once the reactor is in operation, the heat transfer rates and power levels can be pushed upwards to determine the practical limits. It is hoped and expected that exhaustive experiments will be run on this reactor even though it is in use for commercial power production. All the other reactors are being built for experimental development work with power generation, if any, as a secondary feature. In all cases fuel element life, operation and maintenance costs, and reactor life data will be obtained. These are the precise costs that must be assumed today.

Industry is rapidly becoming acquainted with the benefits that might be derived from nuclear reactors. Not only can reactors be used for the dual purposes of production of power and weapon-grade plutonium, but also as a source of industrial chemical manufacture. The substitution of the nuclear radiations, neutrons and gamma rays, for part of the heat in pyrolytic chem-

WM. E. SCHWEITZER & CO.
General Contractors
2207 Dodge Avenue
EVANSTON, ILLINOIS
AMbassador 2-3489 GReenleaf 5-4414
☆ ☆ ☆
Contractors for Industrial Construction

ical chain reactions appears possible in the manufacture of many chemicals. This permits lower temperatures with decreased side reactions. Only the briefest exploratory work along these lines has been done by the Commission, primarily by Bernard Manowitz and others at Brookhaven. It is rightly an industrial problem and the Commission should only point the way. Industry should look carefully at the use of nuclear reactors for combined power, plutonium, and chemical production. The seven year contract for plutonium production, permitted under the Atomic Energy Act of 1954, combined with the production of power, chemicals, food sterilization, etc., should be very attractive.

To be really economical as power plants in this area, nuclear plants must be large, of the order of 500 to 1000 MW of heat. Such reactors with the power producing equipment are expensive. Estimates run from $175 to $400 per electrical kw of installed capacity, or a cost of $30,000,000 to $70,000,000 per plant depending upon the size, the inventory, and whether or not heavy water is used. Heavy water increases the capital costs, but results in substantially increased plutonium production and increased safety.

To obtain cost data, including operating and maintenance costs, will require the construction of several full scale plants. This is industry's job. Under the "Reactor of the Year" plan, the Commission will provide some of the funds through loans or plutonium purchase agreements. While this may be necessary, industry should provide most of the funds. Five full scale plants will require about $250,000,000 for design and construction. Other funds, presumably the Commission's, will be required for the auxiliary fuel fabrication and irradiated fuel recovery plants. It makes little difference when these plants are built, the costs will be about the same. Five plants of different types will provide really valid economic valuations and perhaps permit elimination of some of the types. Five such plants would produce about 1,000,000 kw of electrical energy.

The cost of nuclear power is expected to be somewhere near 6 mills/kw hr. *after* the plants are fully developed. This cost breaks down into about 2 mills for the capital costs of the power plant, 1.5 mills for the capital charges on the reactor, 1.5 mills for the fuel, and 1 mill for operation. The fuel costs are based on the assumption that 2 atoms per 100 may be burned and that high heat rates of the order of 1,000,000 BTU/ft^2 hr may be obtained. Present fuel fabrication and recovery costs were included along with inventory charges on "utility" accounting. The potential developed costs of the homogeneous and fluid fuel reactors is lower than 6 mills; perhaps 5 mills might be considered. Costs using present reactor designs and techniques point to an average of something like 7 or 8 mills for the first plants to be built, since these plants will necessarily be designed on a conservative basis and the power levels increased slowly after the plants are in operation.

Due to the high capital and low fuel charges, nuclear reactors will probably be used to supply base loads.

The growth potential of the nuclear

ABBOTT
CONTRACTORS
INC.

•

3349 South Kedzie Avenue

Chicago 23, Illinois

MORRISON
CONSTRUCTION CO.

ENGINEERS
CONSTRUCTORS

SINCE 1925

Industrial Projects
Public Utilities

TELEPHONES
CHICAGO SAginaw 1-7036; HAMMOND Sheffield 5036

MAIN OFFICE
1834 Summer Street, Hammond, Indiana

Amounts of materials possibly needed by 1975

Material	*Annual Tons*	*Total Tons*
D_2O	1,000 - 2,000	25,000 - 50,000
Th	2,000 - 4,000	10,000 - 25,000
U	4,000 - 8,000	30,000 - 50,000

power industry is enormous. By 1975, it is expected that a large percentage of large *new* base load plants in the industrialized countries will be nuclear fueled. Perhaps several hundred million dollars per year will be spent on the nuclear plants alone. The development of nuclear reactors for fuel-poor areas is harder to evaluate because the markets for power are low in some areas and construction costs are high. The nuclear reactor becomes most economic in units of 200,000 electrical kw or so. Since at least two reactors are needed for continuous operation, the power markets must be large. Reactors might readily be used economically today to supplement the fossil fuel fired plants in Europe and in South Australia. The markets and electrical grids are there and the fossil fuels are expensive. Small nuclear plants might be economical in areas where power costs over something like 15 mills per kw hr with intermediate sized plants being useful in the 10 to 12 mill per kw hr range. The chief advantage to a nuclear reactor is low fuel shipping charges, but return of irradiated fuel for recovery may prove very expensive and small chemical plants may prove to be expensive.

The United States market for nuclear power plants by 1975 is expected to be of the order of several hundred million dollars per year. This includes the turbines and complete plants. (See above.)

We expect that the reduction in power costs in large sections of this country will be 1 to 2 mills in fully developed plants below that of fossil fuel plants. This should result in an even more rapid expansion of the power industry. The use of heat pumps for home heating and increased electric furnace steel are examples of expected changes.

The development of reactors to drive ships may prove to be economical. Advantages are, of course, low fuel weights and low frequency of refueling. However, these costs must be balanced against high construction and inventory costs. These costs may overbalance the saving in fuel.

Conclusion

In the twelve years since controlled nuclear fission was demonstrated here in Chicago, enormous strides toward economical nuclear power have been made. In the past two years, since the Commission's attention has been focussed on nuclear power, progress has been especially rapid. The problems have been delineated; progress has been made toward solution of most of them; and we are now well on the way toward solution of the remaining problems.

To obtain the maximum benefits will require continued coperation of industry and Government. The goal is lowered costs and increased profits. At the same time, we will help the entire world to raise its standard of living.

Radiology Safety Course Is Offered

A course in Radiological Safety is being offered for the third year by the Institute of Industrial Medicine of the NYU Post-Graduate Medical School, a unit of New York University-Bellevue Medical Center, in cooperation with the U. S. Atomic Energy Commission and the NYU College of Engineering.

Sessions will be held daily, morning and afternoon, for two weeks beginning on January 10 and concluding January 21, 1955. Classes will meet in the Medical Science Building at 550 First Avenue (31st Street).

With the ever increasing use of radioisotopes in industry and in all phases of medical and industrial research, there has become apparent a great need for intelligent understanding, on the part of those responsible for safeguarding employees and the public, of the basic principles of radiological safety. In an attempt to fulfill this need, the course has been designed to acquaint industrial hygienists, insurance engineers, state, federal, county and city health officials, industrial and research institution safety engineers, industrial physicians, and present and potential users of radioisotopes and X-ray equipment, with the fundamentals of radiation safety.

Subject matter of the lectures will include: Atomic physics review; interaction of radiation with matter; the theory of detection and measurement of radiation and the principles of radiation detection and measuring instruments; introduction to radiobiology; history of radiation damage; maximum permissible exposures to radiation; uses of radiation in medicine, research and industry; principles of radiological safety; procedures for low level laboratories; radiation shielding; surveying and monitoring instruments and their uses; area and continuous monitoring; waste disposal and transportation; air hygiene; and governmental codes regulating safe use of radioactive materials.

Application should be made through the Office of the Dean, New York University Post-Graduate Medical School, 550 First Avenue, New York 16, N. Y. Tuition: $50.

W. H. LYMAN CONSTRUCTION CO.

General Contractors

•

134 N. LA SALLE • CHICAGO • STATE 2-8154

CRERAR LIBRARY

News and Notes

Crerar Library Associates, an advisory group of industrial, business and professional leaders, now numbers forty-seven. A further step in its development occurred on November 15, when Mr. Bart L'Hommedieu reported for duty as its Secretary. A full-time member of the Library staff, his duties include promotion of the membership program and assistance to the Librarian on general public relations. Mr. and Mrs. L'Hommedieu came to Chicago from Indianapolis, where he has been assisting the Indiana Heart Association in raising funds for heart research and medical care in Indiana.

* * *

November was designated by the General Federation of Women's Clubs as "Know Your Library Month." In recognition of this period, visits and a lecture were scheduled by the Know Your Chicago Committee, which sponsors a program of education in civic leadership. On November 17 and 24, Crerar was host to the group, numbering 60 members on each date. Following brief greetings and general comment, guides from the staff conducted groups through the Library, pointing out various aspects of operations and service activities.

* * *

During October and November, Crerar was represented at two professional conferences by its Librarian and Associate Librarian. The former attended the Conference on Financial Problems of Research Libraries, held in Monticello, Illinois, under sponsorship of the Association of Research Libraries. The second meeting, of the Metals Division of the Special Libraries Association, took place during the National Metal Congress; the Associate Librarian presented a paper on "The Paradoxical Trade Catalog."

National Society Votes Name Change

By a surprisingly heavy total vote of 4081, a majority of 5919 eligible voting members of The American Society of Heating and Ventilating Engineers emphatically expressed their approval of changing the name of the sixty-year old engineering society to American Society of Heating and Air-Conditioning Engineers, Inc. The tellers report showed 3280 in favor, 654 opposed, and 147 invalid.

The new name, as decided at a special meeting at 2:00 p.m. Monday, Nov. 22 in the Hotel Statler, New York, has been filed with the Secretary of State of the State of New York to become effective Nov. 23, 1954.

The American Society of Heating and Air-Conditioning Engineers, Inc. is dedicated to carrying on the traditions and enlarging the scope of the worthwhile services visualized by the founding fathers of The American Society of Heating and Ventilating Engineers in 1894. President L. N. Hunter, of Johnstown, Pa., emphasized that under its new name the membership will continue to advance the arts and sciences related to heating, air conditioning, ventilating and cooling, and the allied arts and sciences.

The special meeting was called to order by the Society president. Casting proxy votes for members who voted by mail were Peter B. Gordon, New York, Walter L. Fleisher, New York, Alfred J. Offner, New York, and Mr. Hunter. The tellers who counted the votes were Joseph C. Fitts, Hackensack, N. J.; Walter M. Heebner, Newark, N. J.; William J. Olvany, Jr., New York; and Charles R. Hiers, New York.

Travel to the Moon Said Just a Bit Closer

That long talked about 238,857-mile trip to the moon may be just a little closer as the result of rocket vibration studies recently completed by Stanford Research Institute, it was reported Nov. 9 at Palo Alto, Calif.

One of the major problems in the design of large-scale, long-range rockets has been a phenomenon known as "combustion instability," which often occurs for no apparent reason. This causes vibrations which can throw a rocket off course and may be violent enough to destroy it.

Described in the current issue of the Institute's news bulletin, *Research for Industry*, the problem was investigated for the Soundrive Engine Company of Los Angeles, pioneers in the rocket field.

The research team worked on the theory that pressure changes within a rocket motor can be controlled by changing the sound absorbing characteristics of the motor walls. Elaborate instrumentation was devised to study the time it takes ordinary burning to build up to detonation in gases within a steel tube. Various liners were experimented with to see if their acoustic qualities would inhibit the formation of detonation waves — thereby eliminating dangerous vibrations.

Coarse bronze liners were found to have the most pronounced effect, markedly changing the detonation characteristics of the tube used in the experiments to simulate a rocket motor.

With knowledge obtained in these studies engineers may now be able to correct rocket instability in the design stage, without costly trial and error methods.

JOHN BURNS CONSTRUCTION CO.

JOHN F. O'MALLEY, PRESIDENT
CEntral 6-9776
105 WEST ADAMS STREET
CHICAGO

And Who Knows . . .

(Continued from Page 8)

Our duty now, as always, is to try to make the choices ahead as wisely as possible.

It is perhaps trite to say we are on new frontiers; the world has always had new frontiers. It is also commonplace to say that our new frontiers are intellectual rather than geographical. However, for a moment let us consider some of the challenges that a frontier always presents. In the opening of geographical frontiers one can distinguish between the adventurer, the explorer, and the frontiersman. The adventurer is one who is interested primarily in thrills—a dilettante as it were, who thinks only of himself. His efforts are of little value and produce practically nothing for those who may come after him. Such selfish adventurers are common in intellectual frontiers. On the other hand, the explorer is one who goes into new territory and then returns to the world from which he left to tell about it. His explorations are useful if he leaves a record which can be understood. Only a few explorers are needed in each generation, but their contribution is a most important one. On the other hand, the frontiersman is an individual who goes into a territory expecting to stay and make it his own—to become a part of its life. He expects to develop the new territory for the use of mankind and reduce the wilderness to permanent usefulness. Our universities require for their continued existence both explorers and frontiersmen, although the colleges do not have a monopoly on such individuals.

It is also true that among the frontiersmen are both the selfish and the unselfish. The selfish man seeks his own gain; the unselfish man builds permanently, not for himself and his children alone, but for a whole host of other men who follow him. Only in the Westerns are the selfish men remembered, and then only as a contrast to bring out the worth of the unselfish.

Let us consider some of the characteristics of the frontiersman.

1. He needs initiative; like the explorer he will also have an urge to explore.

2. Closely associated with this initiative is resourcefulness—the ability to adapt himself to new situations. A student was asked on an examination, "How would you use an aneroid barometer to measure the height of the building?" He replied, "I would tie it to a string and lower if from the top of the building and then measure the length of the string."

3. The frontiersman must be versatile. There is no place in his life for jurisdictional disputes, he has to be carpenter, hunter, stone mason, farmer, and so forth. This versatility is needed on the intellectual frontier also.

4. He must be flexible. New situations continually appear which he cannot foresee. Plans which he makes based on prognostication must be changed when events show his foresight to be defective. If he is penetrating a jungle where he can see only a short distance ahead, he must react quickly. The distinction between the quick and the dead is a real one.

5. He must have courage. In this connection he should clearly distinguish between courage and foolhardiness, so he must have good judgment.

6. He should have common sense. Karl Compton's sister, whom you may know was married to the head of a missionary institution in India, once had an electrician who was wiring the house. She tried to explain to him something that she wanted, and when he did not understand, she said, "Oh, you know what I mean, just use your common sense," to which the artisan replied, "Madam, common sense is a gift of God; I have only a technical training."

7. He must be cooperative. While the frontiersman must be willing to strike out alone, he has to work with his neighbors because the peril of the frontier calls for joint efforts of protection, both against human enemies and against the forces of nature.

8. Above all, the frontiersman has to be a builder, a man who knows he is master both of his own fate and that of others, and his eye must be on the future rather than on the past.

What are some of the objectives our individual groups should undertake? First let me address the engineers.

1. We should develop a much keener historical sense. It is certainly far more important to understand history and its implications than merely to place events in a chronological order.

2. We should recognize and try to transcend the limitations of our own disciplines. We rather properly place great faith in the so-called "engineering method," but we tend to assume that it can provide a solution to all problems. We must recognize that many men (including engineers) often make decisions on the basis of intuition and emotions, and are not always persuaded by logic, particularly mathematical logic, or by arguments which are phrased in unfamiliar terms.

3. We must attain a deeper understanding and greater participation in our political and economic life.

4. We must acquire an appreciation for the cultures of other nations of the world with whom we must live on terms of equality and mutual understanding. Because engineers have played such a large part in the development of our American economy, it may be more difficult for us to understand other cultures. The engineer, who is a man of action,

L. L. WELDY & ASSOCIATES

SPring 7-8575

* **Roller-Smith Corp.**
Circuit Breakers, Switchgear, Bus Runs, High Voltage Switches

* **Sorgel Electric Co.**
Dry type transformers, Unit Substations, Saturable Reactors

* **Sprague Electric Co.**
Capacitors for Power Factor Correction

4201 Irving Park Road Chicago 41, Ill.

must, at the same time, learn to recognize the values of contemplation and philosophical speculation which are dear to the humanists.

On the other hand, I would like to urge our colleagues in the humanities and social sciences:

1. To recognize that there is a true culture in both the thirst for knowledge of the physical world and in the desire of the engineer to "employ the forces and materials of nature for the use of mankind."

2. They should also recognize that the rate of change in the world of physical sciences is such that time seems to be shrinking and, hence there is a need for a sense of urgency though not of panic.

3. They must also accept sincerely, however reluctantly, the need for accelerated development of means of physical defense, and understand why such a large proportion of the efforts of the engineer and scientist must be employed in this direction. Do not think we are happy about this, but your safety as well as ours depends upon our working on this at times behind locked doors, so that often we cannot even tell you what we are doing.

4. They should endeavor to understand more sincerely and to assist us in the solution of the very difficult problem we have in the education of our students. The rapid growth of our body of knowledge and the difficulty of knowing, as Harlan Hatcher suggested, just about everything, makes us always face a choice between the essential and the good.

5. They should also recognize that in the physical and engineering sciences, more than in other fields, the highest productivity appears to occur at a relatively early age, and so we cannot delay too long the time at which our men pass from the student to the productive age.

Common problems for both groups include the necessity of making unselfish and rational judgments as to staff, curricula, and methods necessary to give an education which shall save us from our enemies and, at the same time, preserve those values which are necessary for men to be truly free. In our programs we must continually study what is important; I should say, what is most important, for we may not be able to afford the luxury of giving to our students all that is good, but may have to concentrate on that which is best and in some cases on that which is essential. Having studied searchingly the contributions we and our fellows in other disciplines and vocations can make, we must pool our resources to attempt to bind together the free nations of the world both materially and spiritually. In doing this we must avoid both the Scylla of trying to force on them political and economic concepts and practices that are adapted primarily to our own nation, and the Charybdis of indifference to their need for technical and material aid. Finally, we must preserve in this country what our carefully-reasoned judgments assure us are the liberties without which our way of life is not worth defending. We must also try to carry behind the Iron Curtain an honest persuasive picture of both the material and the intagible values common to the free world, neither deprecating nor exaggerating the role of the United States as an exemplar of those values.

And who knows but what we have come to the kingdom for such a time and such a task as this?

Great Things

Great things are done when men and mountains meet;
This is not done by jostling in the street.
—William Blake

Toll Road Pros And Cons Discussed

Advantages and disadvantages connected with toll roads were pointed out in Detroit, Nov. 11, at a meeting of the Michigan Section of the American Institute of Electrical Engineers at Consolidated Edison Auditorium.

Yule Fisher, National Highway Users Conference Research Counsel, said that, while toll roads may often appear to be the answer to today's traffic problem, there are many undesirable features connected with them.

Commenting on the increased popularity of toll roads, he disclosed that there are now more than 1,000 miles of toll roads in operation and almost 1,500 more miles under construction. In addition, he said, another 4,000 miles have been authorized and 2,500 are under study.

Fisher emphasized, however, that the drawbacks connected with toll roads should be given close consideration. Interest rates on toll road bonds, he said, often are twice as much as on regular state highway bonds. In addition, toll road users will pay a charge equivalent to a gas tax of about twenty-three cents on each gallon of gasoline.

At the same time, Fisher pointed out the specific toll projects which may be justified under exceptional circumstances.

FEDERAL PIPE & SUPPLY CO.

900 S. CAMPBELL AVE.

CHICAGO 12, ILL.

PIPE — VALVES — FITTINGS

PIPE FABRICATION

SEELEY 3-6960

Engineering Societies Personnel Service, Inc.

New York Chicago Detroit San Francisco

These items are from information furnished by the Engineering Societies Personnel Service, Inc., Chicago. This SERVICE, operated on a co-operative, non-profit basis, is sponsored by the Western Society of Engineers and the national societies of Civil, Electrical, Mechanical and Mining and Metallurgical Engineers. Apply to ESPS, Chicago and the key number indicated. Prepared ENGINEERS AVAILABLE advertisements limited to 40 words, with typed resume attached may be submitted to ESPS Chicago by members of Western Society of Engineers at no charge.

OVER THE MANAGER'S DESK

December is when we all like to stop our daily work and think of our friends and business associates. Engineering Societies Personnel Service, Inc. is no different than others. We of the Chicago Staff wish you and yours a VERY MERRY CHRISTMAS.

Bonnell H. Allen, Manager

POSITIONS AVAILABLE

C-22 EL. DISTRIBUTION ENGINEER —Recent Grad. or better. Knowledge of electrical power distribution. Duties: field layout work and drafting on electric utility distribution problems. For firm of general engineers. Employers will negotiate fee. Location MO.

C-2207 ELECTRICAL DESIGNER EE Age: 25-30. 1 plus yrs. exp. in drafting or design of electrical equipment. Knowledge of power and preferably switchgear. Duties: training for position as Chief Draftsman in about two yrs. For a manufacturer of electrical equip. Sal: Up to $450 mo. Employer will pay fee. Location: Chicago.

C-2315 MANUFACTURING EXECUTIVE ME Age: 35-45 5 plus yrs. exp. in heavy machining, welding and fabricating heavy metal products. Knowledge of production and modern management. Duties: supervision of 35 foremen, most of whom are 10-20 yr. employees in mfg. heavy equip. such as lift trucks, covering welding, electrical assemblies, machining and floor assembly operations. For a mfgr. of material handl. equipment. Sal: $9-15,000 dep. on exp. Employer will negotiate fee. Loc: Chicago.

C-2324 CHEMICAL ENGINEER — Chem. Eng. or Chem. 10 plus yrs. exp. in production and laboratory work on finishes. Knowledge of paint plant processes and equipment. Duties: head dispersion and new equipment evaluation laboratory for material paint, enamel and lacquer manufacturer. Will be member of Chicago office general staff but will live in Detroit. For a paint manuf. Sal: Open. Location: Michigan.

C-2327 SALES — CASTERS Engrg. Deg. Age: 22-35 2 plus yrs. exp. in sale of mechanical products through distribution. Duties: sell full line of casters through distributors. For a manufacturer of casters. Salary: $5000 to $7000 to start then drawing and commission. Location: United States.

C-2332 SALES TRANSFORMERS Age: up to 40. 3 plus yrs. exp. selling large transformers or application work. Knowledge of electric furnaces and/or electro plating. Duties: selling large transformers to users and manufacturers of electric furnaces and electroplating eqpt. For a transformers' manufacturer. Sal: $7500 and comm. Employer will pay ½ of fee. Travel: 50%. Car required. Location: Chicago.

C-2334 (f) PURCHASING EXPEDITER — OUTSIDE. Age: 30-45. 2 plus yrs. exp. in manufacturing, expediting or liaison work. Duties: expedite aircraft parts to secure purchased materials. For a mfgr. of heaters. Salary up to $100 per week dep. on exp. Some traveling. Location: California.

C-2365 CHIEF ENGINEER ME EE Chem. or CE 5 plus yrs. exp. in responsible supervisory position and preferably in process industries. Knowledge of pulp mill operations and pumps. Duties: direction of engineering department comprised of 6 section heads and their subordinates to support maintenance, design of new production machinery; some coordination of outside vendors; specifications of equip. feeds and output. For a paper manuf. Sal: $85-10,000 Employer will negotiate fee. Location: Alabama.

C-2371 PLANT MANAGER — Grad. Eng. Mech. of Elect. Age: to 45. 5 plus yrs. exp. in radio and television industry. Duties: complete charge of all maintenance, production and material control, quality control, inspection of large radio and television plant. No actual mfg. all assembly operations, plant employs 1000. Salary: $16,000 approximately. Loc: WW Chgo. suburb.

If placed in a position as a result of an Engineers Available or Position Available advertisement, applicants agree to pay the established placement fee. These rates are available on request and are sufficient to maintain an effective non-profit personnel service. A weekly bulletin of positions open is available to subscribers. Apply ESPS Chicago.

ENGINEERS AVAILABLE

17 MW OFF. ENGR. CE 30 Five and one half yrs. designing and drafting structures, sewers, earthwork, and take-off and estimates. Chgo. $430.

18 MW DESIGNER MSME 32 Fourteen mos. charge of specification dept. Six yrs. design draftsman on heating, ventilating and air conditioning equipment. $8000 Chicago.

19 MW DESIGNER ME 28 Two and one half yrs. design and drafting of central steam power plants, heating and ventilating systems and servicing facilities. $6000 Chicago.

20 MW PROD. ENGR. IND. ENG. 26 Twenty-nine mos. Liaison engr. in electronics coordinating engineering production, advertising, manufacturing and gov't. contracts. Twelve mos. doing liaison work and writing technical manuals with an aircraft company. $6000 Chicago.

21 MW OFF. MGR. ME 34 Forty-two mos. sales, engrg. and office administration work in metal products. Four and one half yrs. Jr. design engr. on ventilating and steam systems. $6000 Chicago.

22 MW ASST. ENGR. CE 65 Nineteen yrs. supervision of supply and flow of materials for annual maintenance programs. Nine yrs, field and office work for R. R. $4000 Chicago.

23 MW IND. MGMT. ENGR. MGMT. 38 Six yrs. responsible for operation of all plant facilities. Two yrs. establish job and cost standards from methods analysis and time study. Four yrs. Sr. Ind. Engr. on cutting tools. $9000 Midwest.

24 MW METHODS ENGR. ME 34 Three yrs. methods, time studies, layouts, specifications on auxiliary eqpt., product design and estimates. One yr. supervision of military personnel. $4800 Chicago.

25 MW CHIEF ENGR. CE 32 Six and one half yrs. supervisor of engineers, draftsmen and clerical personnel for chemical plants. Fourteen mos. engineering and drafting for refinery. One yr. instructor. $9600 Midwest.

Professional Directory

This Space

Reserved

for YOU

E. R. GRITSCHKE
and
ASSOCIATES

Consulting Engineers

Designers of

MECHANICAL and ELECTRICAL SYSTEMS for BUILDINGS

11 S. LaSalle St., Chicago 3, Ill.

SOIL TESTING SERVICES, Inc.

Consulting Engineers

Carl A. Metz
John P. Gnaedinger

Soil Investigators
Foundation Recommendations and Design
Laboratory Testing

3521 N. Cicero Ave., Chicago 41, Illinois
7323 W. Center St., Milwaukee 10, Wisconsin
1105 E. James Street, Portland, Michigan

This Space

Reserved

for YOU

KORNACKER & ASSOCIATES, INC.

ENGINEERS

Bridges, Highways, Expressways and Railways, Building Structures, Industrial Plants, Supervision, Foundations and Soils, Investigations and Reports, Sewerage and Sewage Disposal, Surveys.

53 West Jackson Blvd.
Chicago 4, Illinois

VERN E. ALDEN CO.
Engineers

Design and Supervision
of Construction

Industrial and Chemical Plants
Steam Power Plants

33 North LaSalle St.
Chicago 2

ESTABLISHED 1913

WALTER H. FLOOD & CO.

CHEMICAL ENGINEERS

Inspection and Testing
Of Materials and Structures
Buildings, Roads, Streets, Airports
SUPERVISION OF CONSTRUCTION
CONCRETE CORE CUTTING
6102 S. BLACKSTONE AVE. CHICAGO 37
Branch—1332-4 N. Westnedge Ave.
Kalamazoo 53, Mich.

SARGENT & LUNDY

ENGINEERS

140 S. DEARBORN STREET

CHICAGO, ILLINOIS

Alvord, Burdick & Howson

ENGINEERS FOR

Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation

20 N. Wacker Drive · Chicago 6

Telephone: CEntral 6—9147

DE LEUW, CATHER & COMPANY

Consulting Engineers

Transportation, Public Transit and Traffic Problems

Industrial Plants	Grade Separations
Railroads	Expressways
Subways	Tunnels
Power Plants	Municipal Works

150 N. WACKER DRIVE, CHICAGO 6, ILL.

JENKINS, MERCHANT & NANKIVIL

Consulting Engineers

Municipal Improvements	Sewerage
Power Development	Water Systems
Traffic Surveys	Industrial Plants
Flood Control	Recreational Facilities
Airports	Investigations and Reports

805 East Miller Street
Springfield, Illinois

LESTER B. KNIGHT & ASSOCIATES, INC.

EVIDENCE OF EXPERIENCE

CONSULTING *Engineers*

CHICAGO—NEW YORK
WASHINGTON, D. C.

Your Card* on this or the opposite page will acquaint others with your specialized practice.

*Restricted to Professional Architects and Engineers.

Professional Directory

This Space
Reserved
for YOU

ROBERT W. HUNT COMPANY
ENGINEERS
Inspection • Tests
Consultation
•
Engineering Materials
•
Cement • Concrete • Chemical
Physical and Metallurgical
Laboratories
175 W. Jackson Blvd., CHICAGO, *And All Large Cities*

EDWARD J. WOLFF
ELECTRICAL . . .
MECHANICAL . . .
CONSULTING ENGINEERS
308 WEST WASHINGTON STREET
CHICAGO 6, ILLINOIS

GREELEY AND HANSEN
ENGINEERS
Samuel A. Greeley — Kenneth V. Hill
Paul E. Langdon — Samuel M. Clarke
Thomas M. Niles — Paul Hansen (1920-1944)
Water Supply, Water Purification
Sewerage, Sewage Treatment
Flood Control, Drainage, Refuse Disposal
220 S. STATE STREET, CHICAGO 4

SILAS CARTLAND P.E.
Consulting Engineer
Designer
Air Conditioning System
Mechanical & Electrical
Systems for Buildings
911 Busse Hiway, Park Ridge
Ta 3-1300

THOMAS J. HIGGINS ASSOCIATES, Inc.
School Buildings and Surveys
228 No. LaSalle St., Chicago 1
George I. Uitti, President
Structural Engineer
STate 2-6492

HAZELET & ERDAL
Consulting Engineers
Bridges — Foundations
Expressways — Dams — Reports
Monadnock Block
Chicago
403 Commerce Bldg., Louisville
Dixie Terminal Bldg., Cincinnati

Stanley Engineering Co.
Industrial Power Plants
Steam — Diesel — Hydro
Industrial Utilities
Water — Sewerage — Waste Disposal
327 S. LaSalle, Chicago 4, Ill.
Hershey Building, Muscatine, Iowa

This Space
Reserved
for YOU

Battey & Childs
ENGINEERS
231 So. LaSalle Street
Chicago 4, Ill.
INDUSTRIAL PLANTS
POWER PLANTS
RAILROAD SHOPS & TERMINALS
DESIGN — SUPERVISION

This Space
Reserved
for YOU

JOHN F. PARMER
Engineers

Designing	Structural System
Consulting	Industrial Bldgs.
Investigations	Foundations
Reports	Pavement
Supervision	Bridges

173 W. Madison St. — Chicago 2
FRanklin 2-4198

Your Card* on this or the opposite page will acquaint others with your specialized practice.

*Restricted to Professional Architects and Engineers.

G. M. Produces 50 Millionth Car

General Motors on Nov. 23 produced its 50 millionth car in the United States.

A golden 1955 Chevrolet, rolling off the line in Chevrolet's Flint Assembly Plant, Flint, Mich., brought the unprecedented industrial feat to completion in the presence of President Harlow H. Curtice and other top GM executives, newsmen, and many plant employes.

The production total included the United States output since organization of GM in 1908—46 years ago—of the Chevrolet, Pontiac, Oldsmobile, Buick, Cadillac and GMC Truck & Coach divisions of General Motors as well as the limited numbers of other GM makes no longer in production.

A nationwide "Golden CARnival" celebration began when GM reached the historic 50-million milestone at approximately 10:10 a.m. (EST). GM held Open House to America, inviting the public to visit 125 plants and training centers, and hosted luncheons for civic and business leaders in 65 cities.

Flint closed its schools for the day and watched a spectacular parade, including five of the nation's top college bands, march for an hour through the gaily decorated business section while 8,000 gold-tinted balloons swirled overhead.

Attendance at the various plants in GM's first nationwide open house was expected to exceed one million. Some 18,000 guests at the 65 civic luncheons saw and heard a talk by Curtice over the largest closed television network ever used, or heard it via telephone.

The GM president also saluted the firm's employes for their achievement in a special filmed message shown in plants and offices throughout the United States.

"No one ever before has come close to producing 50 million cars in the United States," he told them.

Even while GM plant whistles throughout the nation sounded triumphant blasts and employes hoisted special gold flags in commemoration of the production feat, assembly lines continued to operate and the company set its sights on its second 50 million cars and trucks. Curtice predicted that GM would reach the 100-million mark "within the lifespan of many" GM employes.

This prediction was supported by GM's record throughout its history of a steadily accelerating production pace and always quickening rate of technological advance.

From its beginning in 1908, it took GM a little more than 10 years to build its first million vehicles. In a little more than another 10 years, it reached the 10-million mark. That was in July, 1929. The pace quickened still more and in January, 1940, GM produced its 25 millionth car and celebrated the event in Flint. Commercial passenger car production was suspended during World War II but was resumed at an accelerated pace after the war.

Curtice emphasized, however, that the production of 50 million vehicles was an achievement not only of the General Motors team of employes, shareholders, dealers, and suppliers, but of all America. It has taken the "cumulative efforts of all businesses," he pointed out, to create the national wealth and standard of living that has made possible a market for 50 million cars.

Curtice paid special tribute to the all-important role of the American consumer in making possible production achievements like the building of 50 million cars. Only a "bare handful" of the 1,850 makes of car that have appeared on the market now survive, he said, because the others "did not sufficiently consider the wishes" of the customer.

Although the Golden CARnival was a nationwide celebration, it focused on this hustling city where over 70,000 GM employes work at the headquarters and plants of Buick Motor and AC Spark Plug divisions, plants of Chevrolet, Ternstedt and Fisher Body divisions, and General Motors Institute.

Flint turned out en masse and thousands of persons swarmed into the city from nearby towns to watch the giant parade and attend plant open houses. Other thousands watched the parade over eight Michigan television stations or listened to it on the radio.

Rides on Flint buses anywhere in town were free throughout the day, courtesy G.M.

The Flint celebration began at 9:45 a.m. when the body of the car designated as GM's 50 millionth—a 1955 Chevrolet Bel Air Sport Coupe—was lowered onto the chassis at the "body drop" point on the Chevrolet assembly line. Hardware of the historic car was gold plated and other parts were painted gold.

Headed by Curtice, top GM executives and over 100 newsmen from across the nation followed the car down the final assembly line to its completion, signaled by the crash of aerial bombs outside the Chevrolet plant and the shriek of whistles at all GM plants. Curtice spoke briefly to employes in the Chevrolet plant.

The hour-long parade, beginning at 11 a.m., featured 18 floats, golden cars or trucks representing all GM passenger car and truck divisions, and marching units including the combined Flint high school bands, the Scotch Highland Band of Detroit, and bands from The University of Michigan, Michigan State College, Notre Dame University, Wayne University and University of Detroit. The 50 millionth car rode proudly on a float at the end of the procession.

GILBERT-HODGMAN, INC.

Electrical Engineers and Contractors

327 SOUTH LA SALLE STREET

CHICAGO 4, ILLINOIS

Members W.S.E.—A.I.E.E. HA rrison 7-8774

a good advertising medium

FOR ALERT ADVERTISERS

Midwest Engineer

because . . .

- Circulation in America's industrial and residential heart.
- The direct path to specifying, purchasing, and industrial executives—those who say yes.
- Provides coverage in all engineered industries.
- Opens a live market area for machinery, fabricated products, industrial equipment, materials of construction, parts, tools, products and services.
- The mirror of the coordination of engineering and civic interests.
- Advertising rates are extremely low for coverage of this big market.

Western Society of Engineers

84 E. Randolph Street
Chicago 1, Illinois

Reviews of Technical Books

Construction Materials

Materials of Construction, by M. O. Withey and G. W. Washa, John Wiley & Sons, Inc., New York, N. Y. Ninth Edition, 1954. Price $9.00.

This comprehensive text continues on the excellent tradition of its predecessors. The first edition of *The Materials of Construction* by the late Dean J. B. Johnson was published at the turn of the century. In 1918 the late Dean F. E. Turneaue, M. D. Withey and James Aston rewrote the book producing the 5th edition. Since then three editions had been published each embodying numerous changes.

The present edition was brought completely up to date by extensive changes made largely by G. W. Washa. The text gives data on the sources, manufacture and fabrication of the principle materials of construction. It gives the up to date statistical data on the more important physical and mechanical properties and the influence of various factors on these properties of the materials of construction.

The materials covered in this book are timber, building stone, structural clay products, cements, limes and plasters, concrete aggregates, concrete, irons, steel and its alloys and some non-ferrous metals and alloys. Special chapters cover the review of the principles of mechanics of materials, machines and appliances for mechanical tests and fatigue of structural materials. This book can be used both as a textbook and as a reference book.

B.A.W., W.S.E.

Compressible Fluid Flow

The Dynamics and Thermodynamics of Compressible Fluid Flow, Vol. II, by Ascher H. Shapiro, The Ronald Press Company, New York, N. Y. 1954.

This second volume completes the author's admirable treatise of our present state of knowledge of the flow of compressible gases. Its four parts contain: the conclusion of Part V in Vol. I on Supersonic Flow, and Parts VI to VIII, entitled: Mixed Flow, Unsteady Motion in One Dimension, Flow of Real Gases with Viscosity and Heat Conductivity.

The final sections of Part V are devoted to problems of steady-state supersonic and hypersonic flow, mostly in the field of aerodynamics, such as flow around cones, projectiles and wings. Application of the Method of Characteristics is again, as in previous chapters, illustrated in detail. Axially symmetric flow in diffusers and nozzles is included in this section. The sixth part deals with the transition region from subsonic to supersonic flow and vice versa. The presentation is confined to two-dimensional, irrotational, steady-state phenomena with no restriction regarding the magnitude of the perturbations. The hodograph method and the similarity method are applied to the solution of problems covering a wide range from nozzle flow to lift and drag forces on wings. This part ends with a discussion of the possibility of a shock-free transition through the transonic zone.

To mechanical engineers, the seventh part will be the most appealing one. Here are treated one-dimensional unsteady flow problems, such as they occur in various elements of periodically operating mechanisms. Continuous waves and shocks, their reflection on walls and discontinuities, and their mutual interactions are the principal topics. Graphical and analytical methods are given, and once more, the application of the method of characteristics is shown in complete detail. The eighth part treats the properties of laminar and turbulent boundary layers, and the phenomena arising from interaction between these and shock waves. Flow with heat transfer and the concept of the recovery factor are discussed extensively.

Throughout the book, experimental results accompany the theoretical presentation, giving the reader a feeling of the reality of the problems under discussion and of the correspondence between theoretical and experimental results which has been achieved by present-day flow theories. Each chapter has a well selected group of problems and an ample bibliography. The diligent reader will profit from both. The presentation of the subjects covered is exemplary, and all theoretical derivations are given without gaps. The engineer working in any field of applied compressible flow will, after a brief acquaintance with this book, discover that it has become indispensable to him.

E.F.L.

Analysis of Structures

Model Analysis of Structures, by T. M. Charlton, John Wiley & Sons, 1954. 139 pages. Price $5.00

This is a brief treatment of model analysis and it contains a well-written description of certain theories and techniques. The theory covers basic laws of similarity of model to prototype, utilizing dimensional analysis and Buckingham's π-theorem. The fundamental Muller-Breslau principle concerning influence lines is recalled and its application to model analysis is illustrated. In addition, the applications of some direct methods of model analysis are explained.

Types of structures studied include a statically indeterminate truss with a single redundant, also single and multiple-span rigid frames. The various model analysis techniques described are those of the Beggs Deformeter, the Gottschalk Continostat, the Rieckhof Nupubest, and the creep-compensating dynamometer.

The book would be helpful as a text for a course in structural model analysis. It would also be a useful reference in engineering offices where complex structures are designed. More model studies of such structures would be valuable to verify mathematical analyses, to discover calculation errors, and to portray both qualitatively and quantitatively their load deformations.

E.I.F.

Prudential Building Topped Out

Steel framework of the 41-story Mid-America headquarters of the Prudential Insurance Company of America building on Chicago's lake front just east of WSE headquarters reached the top with a traditional "topping out" celebration on Tuesday, Nov. 16.

Thousands of the skyscraper's devoted sidewalk superintendents, as well as wives and families of the iron workers, were on hand for the ceremony which began at 11:30 a.m. They watched as crews of American Bridge Division of U. S. Steel Corporation attached the American flag to the first column of the top floor of the building and hoisted it over 600 feet to the top.

History was made for this was the first topping out of a major skyscraper in Chicago since the Field building was completed 20 years ago. The ceremony was attended by about 150 civic and business leaders, including officials of the City and Park District, the Prudential Insurance Company, U. S. Steel, George A. Fuller Company, Naess and Murphy and Leo J. Sheridan & Company.

Mayor Martin H. Kennelly, Norman B. Obbard, president of American Bridge Division, Pittsburgh, Pa., and James E. Rutherford, vice president in charge of the Mid-America home office, Prudential Insurance Company of America, assisted in attaching the American flag to the first column of steel for the top.

G. W. (Tex) Twining, superintendent of erection for American Bridge, signaled the raising crew to lift the 27-foot-long column, known as "D-8." On top, as is traditional, the ceremony was taken over by the bridge and iron workers. They set the column in place and doffed their steel helmets to cheer the completion of their job.

The completion of the steel framework took place 13 months after the first steel was erected for the superstructure. Ground was broken in August 1952. The building is scheduled for completion late in 1955.

About 150 iron workers have been employed by American Bridge in the erection of the framework. They set 32,000 tons of structural steel.

Steel for the Prudential building was rolled at U. S. Steel plants in the Chicago and Pittsburgh districts and was fabricated by American Bridge in Gary, Ind. and Ambridge, Pa. All of the steel was shipped to the site by rail.

Most serious problem that confronted engineers was that the building was to be erected over 18 railroad tracks. Work on the giant steel skeleton stopped during rush hour traffic to permit Illinois Central suburban trains to come and go uninterrupted. Lack of space to store the steel at the building was another obstacle.

American Bridge adhered to a rigid safety program and no fatalities have been suffered on the huge skyscraper up to this time. Bridgemen are taught to be alert and the company requires that they wear safety helmets and belts. Also tools and equipments used by the men are checked regularly.

The Prudential building has been described by Architectural Forum magazine as offering "more special services and higher space standards than any other office building in the world." The professional journal has credited Prudential with starting "the development of the biggest and most dramatically located unused tract in Chicago or any other American city." This is the air space over the railroad tracks between Michigan avenue and Lake Michigan from Randolph street north to the Chicago River.

Rising 601 feet, the Prudential building will be Chicago's highest structure. A steel tower and antenna for WGN-TV, to be mounted on the building, will rise to a height of 925 feet above ground.

The skyscraper will have more than 1,000,000 square feet of rentable floor area. Of this the insurance company will occupy about 30 per cent. The remainder will be leased. It will feature year-around air conditioning and boasts the fastest and most modern elevators in the world.

The building and surrounding viaducts rest on 253 foundation caissons sunk at approximately 100 feet to bedrock.

George A. Fuller Company is the general contractor. Naess and Murphy are the architects and engineers and L. J. Sheridan & Company is the rental agent.

Lives Well Insured

Americans probably carry more insurance than any other people, according to the Chamber of Commerce of the United States. Nearly 100 million of us own life insurance with policies totalling $320 billion — considerably exceeding the national debt of $278 billion.

Contracting & Material Company

Engineers and Contractors

★

1235 Dodge Ave., Evanston, Ill.

ROgers Park 4-1295 GReenleaf 5-6960

Most Smoke Caused by Violations

Sixty-five per cent of the dense smoke over Chicago is produced by people operating in violation of the city ordinance.

This was brought to light in a survey of dense smoke observations made during 1953 by Chicago smoke inspectors and reported Nov. 10 at the Midwestern Air Pollution Prevention association fall meeting in the Sherman hotel.

The report was made by Edward G. Fochtman, research chemical engineer at Armour Research Foundation of Illinois Institute of Technology, which conducted the survey for the association.

The survey, based on records furnished by the City of Chicago's Department of Air Pollution Control, concerned a random sample of 15,000 reports in the three densest categories.

Fochtman said 44 per cent of the smoke reports showed violation of the city ordinance.

Smoke is recorded in 5 densities, but the survey dealt only with the three highest. Number 3 density smoke is permitted for a limited period of time. But numbers 4 and 5, the heaviest densities, are outlawed by the city, Fochtman explained.

Fochtman underscored five areas in which "a minimum of effort would result in a maximum of smoke pollution reduction."

These, he said, are:

—Smoke violations.

—Industrial heating plants.

—Large oil burners.

—Incinerators, especially open fires.

—Railroad roundhouses.

He presented a graph which showed that during 11 months of the year industrial heating plants were responsible for more smoke reports than any other classification of smoke source based on building use.

Other classifications used were apartment buildings, small stores with apartments on the second floor, commercial structures, and a general category that included institutions and schools among others. Locomotive smoke was treated separately.

Of the total number of smoke reports on buildings, industrial heating plants accounted for 36.5 per cent; apartments, 21.8; store-apartment buildings, 17.2; commercial, 9.7, and the institutions, etc., 14.8.

The survey revealed that Chicago air is smokiest during December or March between 7 and 10 a.m. in an area bounded by Irving Park road, 16th street, Central avenue, and Lake Michigan.

Fochtman reported that 48 per cent of the smoke reports on buildings were made between 7 and 10 a.m. and that 59 per cent of the locomotive smoke reports came in the same period.

"The pollution in the city is definitely related to the heating problem" he said, "and from September to May or June smoke pollution can be expected to be 6 to 8 times as much as during the summer months."

Fochtman explained that one reason for high numbers of smoke reports in October and March, as well as in December, is that operation of a heating plant on an intermittent basis, caused by changeable weather in spring and fall, produces more smoke than continuous operation.

Out of the sample of 1,000 smoke reports covering the building category, approximately 50 per cent came from the area between Irving Park, 16th street, Central avenue and the lake.

Other findings in the Armour Research Foundation survey showed:

—Illinois coal produced smoke of below average density and duration, while high smoke production was noted for Indiana and Kentucky coals.

—Peak railroad smoke production occurred in July.

—Five major railroads accounted for 90 per cent of the 500 locomotive smoke reports in the sample.

—52 per cent of the locomotive reports were on passenger service locomotives.

Students Can Combine Experience with Study

An opportunity to combine college study with practical experience is being offered by Armour Research Foundation of Illinois Institute of Technology.

The program is available in the mechanical and metallurgical engineering fields through the Foundation's cooperative scholarship program, administered jointly by Illinois Tech and the Foundation.

Any graduate of an accredited high school who ranks in the upper 25 per cent of his class is eligible for the program.

Here's how the program, which lasts approximately five and one-half years for each student, operates:

The student first attends Illinois Tech for two consecutive semesters, taking a regular schedule of courses leading to a degree in mechanical or metallurgical engineering.

The student does not take classes during the third semester, but is employed on a full-time basis by the Foundation in work related to his field of study.

The student in successive semesters alternates between classes and work at the Foundation until he earns his B.S. degree.

During the semesters he works, the student receives stipends based on current competitive rates.

TYPE J2A
Extended Range
Meter

THOSE WHO KNOW
CHOOSE
SANGAMO
Watthour Meters
Current Transformers
Time Switches

TYPE RC-6B
Current
Transformer

SANGAMO ELECTRIC COMPANY
Room 1942
Field Bldg.
135 South LaSalle St.
Chicago 3, Illinois
Telephone
STate 2-0438

Portland Cement Is Given Award

The Portland Cement Association was presented Nov. 8 in Chicago the National Safety Council award for outstanding safety performance in 1953.

Paul Jones, public information director of the National Safety Council, made the presentation at the opening session of the Association's annual meeting in Chicago.

Praising the Portland Cement Association for its part in accident prevention, Jones said, "It is this kind of support and leadership that is winning the war on accidents."

Announcement that Portland Cement Association was one of eleven associations honored by the Safety Council for outstanding work in promoting safety had been made October 19 at the 42nd National Safety Congress in Chicago.

It marked the second time the Portland Cement Association's safety program has been so honored since the Safety Council award was created three years ago. The PCA also received the award in 1951, the first year it was presented.

The year 1953 was a record safety year for the Association. The 152 member company operations (plants and quarries) set all-time low injury frequency and severity rates of 3.81 disabling injuries per million man-hours worked and 1.67 days lost and charged per thousand man-hours worked, respectively.

As a result of these achievements, the Association membership had the most favorable output-injury ratio in the 38-year history of their accident and prevention activities, while the industry set a new production high. This record ratio of 861,000 barrels of portland cement produced per disabling injury was 25 per cent more than the 1952 figure.

Reported mishaps in 1953 were 15 per cent fewer than the total in 1952 and 6 per cent fewer than in 1951, the previous best Association safety year. The greatest number of cement plants in the annals of PCA safety trophy competition finished the year accident-free in 1953.

In making the awards to the Portland Cement Association and ten other associations for 1953, the National Safety Council's technical committee and seven-man committee of judges took into consideration accident prevention activities such as publicity, safety conferences, contests and publication of technical material.

College Accredited

Accreditation of the Fenn College program in chemical engineering by the nation's foremost accrediting body for engineering curricula has been announced by Dr. William A. Patterson, dean of the School of Engineering at the Cleveland, Ohio, cooperative college.

Approval—by the Engineers Council for Professional Development—applies to both Day and Evening Division curricula and completes Fenn's accreditation in all its engineering programs.

The chemical engineering curriculum is the fifth Fenn engineering program to win ECPD approval since 1951. In that year, the programs in electrical, mechanical, and metallurgical engineering were granted full accreditation after having held provisional approval. Civil Engineering received full approval last fall.

News of this latest recognition came by letter from the New York headquarters of the Engineers Council for Professional Development. It followed inspection earlier this year by the American Institute of Chemical Engineers on whose recommendation accreditation in chemical engineering is granted.

Dr. Aaron J. Teller is chairman of the department of chemical engineering at Fenn. He became department head in Sept. 1951 after having served as acting head for nearly two years.

Carey to Retire From ASCE Position

The forthcoming retirement of William N. Carey as Executive Secretary of the American Society of Civil Engineers has been announced at the organization's headquarters in New York. The retirement will take effect May 1, 1955.

Col. Carey, former chief engineer of the Federal Works Agency and former city engineer of St. Paul and distinguished in many fields of civil engineering, will become secretary emeritus. He will be succeeded by William H. Wisely, of Champaign, Illinois, at present executive secretary of the Federation of Sewage and Industrial Wastes Associations and editor of its publication, *Sewage and Industrial Wastes*. Wisely will go to New York Jan. 1 as associate secretary. He holds engineering degrees from the University of Illinois.

Col. Carey, a member of the Society since 1916 and a former member of the Board of Direction, became executive secretary in 1945. He served in World Wars I and II as an officer in the Corps of Engineers. He received an official military award of commendation for his work during World War II.

Col. Carey co-authored a manual, "*Military Roads in Forward Areas*," which was used extensively as a text and reference work in World War II and was used also by American engineers in Korea. He is a member of many profession-wide committees and has represented the profession as a whole in many international conferences.

NASH BROTHERS CONSTRUCTION CO., INC.

Engineering Contractors

1840 South Kilbourn Avenue

Chicago 23

Ford Heads Portland Cement

Emory M. Ford, Chairman of the Huron Portland Cement Co., Detroit, Mich., was elected chairman of the Board of Directors of the Portland Cement Association at its annual meeting in Chicago on Nov. 10. Ford has served the Association as a member of the Board of Directors for the past 11 years and as a member of the Executive Committee for the past year. He succeeds R. A. Hummel, Chairman of the Board of the Lone Star Cement Corp., who has served as Chairman of the Board of the Association for the past two years.

Two new directors were also elected by Association members at their annual meeting. They are: H. B. Robeson, president, Nazareth Cement Co., Nazarath, Pa., and James H. Ackerman, president, Dragon Cement Co., Inc., New York.

The Portland Cement Association is a national organization to improve and extend the uses of portland cement and concrete.

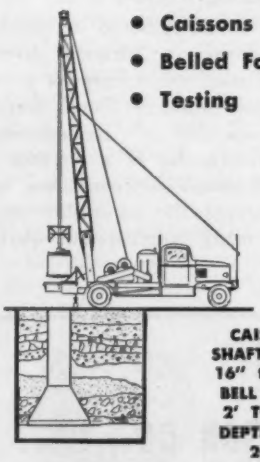
Ford has a distinguished background of service in Association activities. He was first elected to the Association's Board of Directors in 1943, and has served continuously as a director to the present. He also has served three times on the Executive Committee of the Association, and as a member of several special committees.

Ford was elected Chairman of the Huron Portland Cement Co. in January 1953, after serving more than 11 years as president of that organization. He is also chairman of the Board of the Wyandotte Chemical Corp. Directorships include Pittsburgh Consolidation Coal Corp., Cutler-Magner Corp., and Manufacturers National Bank, Detroit. He is president of the Board of Trustees of Jennings Hospital, Detroit. His home is in Grosse Pointe, Mich.

The retiring directors are: M. E. Grunewald, president, Coplay Cement Manufacturing Co., Coplay, Pa., and D. A. Symmes, president, Glens Falls Portland Cement Co., Glens Falls, N. Y.

INVESTIGATE ECONOMY OF

- Drilled Piling
- Caissons
- Belled Footings
- Testing



CAISSON SHAFT SIZES 16" to 84" BELL SIZES 2' TO 12' DEPTHS TO 200'

Case Foundation Co.
Lake St. and Barrington Rd.
Roselle, Illinois
(Suburban Chicago)
Tel. AUstin 7-3584

Branches:
Los Angeles—CRestview 6-8675
San Francisco—LAndscp. 6-8622

Young Man, Don't Envy Alger's Heroes!

Young men and women starting out in business today have a better chance to succeed than yesterday's heroes of the famed Horatio Alger books, according to President Clem D. Johnston of the Chamber of Commerce of the U. S.

Johnston pointed out that the heroes of the Alger books, for all their diligence, honesty and thrift, usually owed a part of their eventual success to a boost from a guardian-angel type of benefactor.

"The 19th century," Johnston said, "was still an era of congealed social classes. The Alger hero didn't succeed without a benefactor, because in those days few persons did—regardless of initiative and effort."

The 20th century, Johnston said, has brought a new kind of society in which youth does not have to depend so heavily upon luck or a benefactor. All youth needs today is ambition, courage and proper schooling. The prospects offered by the approaching atomic age dwarf the imagination.

Electronic Machines Make Men Smarter

Electronic machines can give an employe enormously greater mental power by taking the "routine" out of routine office work, Dr. Haldon A. Leedy, director of Armour Research Foundation of Illinois Institute of Technology, said on Nov. 8.

Leedy told 200 electronic engineers attending the Computer Applications symposium on the Illinois Tech campus that office management is beginning to consider automation as the answer to high administrative costs.

Automation—the substitution of machines for human effort—has progressed much further in plant operation than in application to office work, he said.

"But there is every indication that the process of adapting electronic elements to the business office will become increasingly simple as the production of electronic computers expands.

"These adaptations, in combination with standard office machines, can replace cumbersome manual and clerical procedures," Leedy pointed out.

Here are some of the things Leedy said electronic units can do now:

—Learn what is "told" them, apply the instructions at the proper time, read and remember numbers, add, subtract, multiply, divide and round off.

—Look up numbers in tables, inspect a result and make a choice, perform operation chains in sequences, write an answer and check its accuracy.

—Arrange in either numerical or alphabetical sequence and tell when one problem is finished in order to go on to the next.

Any machine that can do these things automatically is potentially capable of taking over most clerical functions in an office, Leedy stated.

To illustrate this labor-saving ability, he told of a 2-million member book club that effected a savings of more than 10,000 man hours a month by redesigning its office operations to use electronic and mechanical devices.

The instruments also can be utilized for automatic inventory control, cost accounting, and billing. Other instruments, for specialized functions such as translating languages, also have been produced, he said.

WSE Personals

Harold J. McCreary, MWSE, consultant, Automatic Electric Company, was initiated as a professional member of the Beta Psi chapter of Eta Kappa Nu Association, electrical engineering honor society at the University of Nebraska Nov. 30, 1954. McCreary is a graduate of the University of Nebraska of the 1923 class with a BScEE degree and was later awarded a Professional EE degree for a thesis on his invention entitled, *"The Magnetic Cross Valve."* The Automatic Electric Company has obtained patents upon the cross valve.

McCreary is also a senior member of the Institute of Radio Engineers besides being a member of the Western Society of Engineers. He was secretary of the National Electronics Conference (1950-51) and a director for three years. In the AIEE he has served as chairman of the electronics group of the Chicago section and is now a member of the electronics committee of the National AIEE. He has served as chairman of the Communication section of WSE and as meeting and papers chairman of the Chicago section of the IRE. He is now program chairman of the Professional Audio Group of the IRE Chicago section and on the Basic Science group of the AIEE Chicago section.

Just thirty years ago he filed patent No. 2,013,162 on Cathode Ray Television in Color.

McCreary now has 124 patents in 25 countries of which 44 patents are in the United States. Most of these patents are assigned to the Automatic Electric Company. He and his wife live in Lombard, Illinois, where they raised a son, Craig E., who is also a graduate engineer now practising engineering with the navy.

* * *

Lynn J. Riege, MWSE, engineer in charge of materials handling equipment, Quality and Service Department, United States Gypsum Company, has been elected president of the Chicago chapter of the American Material Handling Society. He had served as executive vice-president, and as treasurer, before achieving his present post in the society. Riege has twice been awarded the Certificate of Merit from the material handling society.

The Chicago chapter in 1950 became affiliated with the American Material Handling Society. The latter is an international organization whose purpose is to enhance the "art and science involving the movement and storing of all types of materials."

Riege, who is a graduate of the Missouri School of Mines and Metallurgy, is an active member of WSE. In addition he has written technical articles for trade journals.

Dr. James B. Conant (right), United States High Commissioner to Germany, is shown congratulating **Dr. Gustav Egloff** (left), MWSE, for being awarded the Carl Engler Medal Award for 1954. The award was bestowed upon Dr. Egloff by the German Society for Mineral-Oil Science and Coal Chemistry. It was awarded on Oct. 7, 1954, during the annual meeting of the society. This was the first time the award has been bestowed upon a foreigner.

H. P. Sedwick, past-president of WSE, who is president of Public Service Company Division of Commonwealth Edison Company, was the luncheon speaker at the Fourth Annual Power Supplier Conference on the 4-H Electric Program which was held Dec. 1 in Chicago.

Sedwick, whose company has been cooperating quite actively with the 4-H Electric Program since 1938, spoke on the importance of the role which 4-H boys and girls can play in farm and home electrification.

The Power Supplier Conference was held during the National 4-H Club Congress.

POWERS-THOMPSON
Construction Co.

GENERAL CONTRACTORS AND
CONSULTING ENGINEERS

Concrete and Heavy Construction

MAIN OFFICE:
27 South Chicago Street
Telephone 4254 Joliet, Illinois

Obituaries

The Western Society of Engineers has recently been notified of the following deaths:

* * *

Chason W. Brooks, who had been a member of the Western Society of Engineers since 1904, and a Life Member since 1941, died on September 20, 1954. He was a retired construction engineer. He had formerly been a partner in the firm of Brooks & Stewart, consulting engineers. Also he had been the Chicago manager of the Chicago Bridge and Iron Works. He had been one of the few members on the Western Society roster with a membership of fifty years. During 1935 to 1943 he had served on several of the committees of the Society.

* * *

C. L. Conrad, who had been a member of the Western Society only from November, 1953, died on September 15, 1954. He had been district manager for Diamond Power Spec. Corporation.

* * *

Joshua D'Esposito, who had been a member of the Western Society of Engineers since 1919, and a Life Member since 1949, died on November 16, 1954. The Western Society had given him an honorory membership in 1950. He had been a construction engineer for the Chicago subway system. He had also been an engineer on various large private construction programs. He was also project engineer for the Chicago Sanitary District on an $80 million development. He came to the United States from Italy when he was 19 years of age, and held jobs in various other locations before coming to Chicago as chief engineer for construction of the Union Station.

* * *

E. James Fucik, Life Member of the Western Society of Engineers, died on September 28, 1954 in Evanston, Illinois. He had retired in 1943 from the position of vice president and director of the Fitz Simons & Connell Dredge & Dock Company of Chicago. He had served the firm in the same capacity since 1926. His entire professional career had been devoted to the design and construction of river and harbor works on the Great Lakes.

RELIABLE

Contracting and Equipment Company

GENERAL CONTRACTORS

Specializing in Underground Construction

100 N. LaSalle **CEntral 6-1816**

Index of MIDWEST ENGINEER *Advertisers*

Abbot Contractors Inc.....16
Vern E. Alden.....22
Aldis & Company.....14
Alvord, Burdick & Howson.....22
Asbestos & Magnesia Materials Co.. 5
Battey & Childs.....23
Bell Lumber & Pole Co.....13
Gus Berthold Electric Co..... 9
John Burns Construction Co.....18
Silas Cartland.....23
Case Foundation Co.....30
Commonwealth Edison Co....Cover IV
Contracting & Material Co.....27
De Leuw, Cather & Co.....22
Federal Pipe & Supply Co.....20
Walter H. Flood & Co.....22
Gilbert-Hodgman, Inc.....24
Greeley & Hansen.....23
E. R. Gritschke & Associates.....22
The Haines Co.....11
Hazelet & Erdal.....23
Thomas J. Higgins Associates, Inc..23
Robert W. Hunt Co.....23
Jenkins, Merchant & Nankivil.....22
Lester B. Knight & Associates.....22
F. J. Kornacker & Associates.....22
W. H. Lyman Construction Co.....17
Morrison Construction Co.....16
Muncie Construction Co.....10
Nash Brothers Construction Co.....29
John F. Parmer.....23
Portland Cement Association..Cover II
Powers-Thompson Construction Co...31
Reliable Contracting & Equipment Co.....32
Sangamo Electric Co.....27
Sargent & Lundy.....22
Wm. E. Schweitzer & Co.....15
Soil Testing Services.....22
Stanley Engineering Co.....23
Unistrut Products Corp..... 4
Valentine Clark Corp..... 8
L. L. Weldy & Associates.....19
Edward J. Wolff.....23

Help the Society help you!

Keep it posted on changes in your status

To make sure we have you listed correctly, if you change your status

MAIL FORM TO THE WESTERN SOCIETY OF ENGINEERS
84 E. Randolph St., Chicago 1, Ill.

Name:.....

Position:.....

Firm:.....

Firm Address:.....

Home Address:.....

Home Phone:..... Business Phone:.....

REACH OUT to those who need you!

give

Community Fund of Chicago

COMMONWEALTH EDISON ENGINEERS ARE TRAINING RIGHT NOW FOR THE COMING ATOMIC AGE

In an atomic power plant, uranium or other fissionable material serves as fuel to produce steam which then drives the turbine. Design was developed in A. E. C.'s Argonne National Laboratory, southwest of Chicago.

Nuclear power may be put to work making electricity economically sooner than you think. For several years now, Commonwealth Edison engineers have been contributing their efforts to hastening the day when this may become a reality.

Engineers selected from within the company have received valuable training through work on a number of atomic power plant designs. Currently, Edison men are participating in a five-company study of full-scale nuclear plants.

The coming change to nuclear power will be evolutionary, rather than revolutionary. It will supplement the present sources of power gradually as the load grows and as engineers solve the many technical problems.

Harnessing the atom's power is basically a challenge to the utility engineer. The question is not: Can it be done?—but: How can we do it economically? Finding the answer calls for just about every kind of engineering skill.

Which just goes to prove what we've said right along: Engineering is the heart of our business—both now and in the coming era of atomic power.

COMMONWEALTH EDISON COMPANY | PUBLIC SERVICE COMPANY

PIONEERS IN PROGRESS FOR OVER 66 YEARS